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THE BACILLUS TUBERCULOSIS AND THE ÆTIOLOGY OF TUBERCULOSIS.—IS CONSUMPTION CONTAGIOUS?

SECOND COMMUNICATION.

[Read before the Philadelphia County Medical Society, Nov. 14, 1883.]

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(Continued from page 153, vol. ii.)

V.—THE BACILLUS TUBERCULOSIS—ITS NATURAL HISTORY, MORPHOLOGY, DETECTION, HABITAT, SIGNIFICANCE, AND DIAGNOSTIC VALUE.

I will now speak about the bacillus proper, and will allude here briefly to its natural history, morphology, habitat, significance, detection and diagnostic value.

The bacillus discovered by Koch, of Berlin, as is well known, is a vegetable organism, and belongs, according to Cohn's classification, to the group of filamentous bacteria (Desmo-bacteria), variety Bacillus.[1]

The tubercle-bacilli form, according to Koch, a species of bacillus by themselves, and on Koch's authority as a *mycologist* we can accept this statement as correct until proved otherwise.

The tubercle-bacilli present themselves as thin, slender rods, in length varying from one-third to the whole of the diameter of a human red blood-corpuscle; in breadth they do not exceed one-fifth to one-tenth of their length. They vary in size in different locations, and, according to observations made by myself conjointly with George Bodamer, my assistant, they vary also greatly in size in different artificial culture-media. In nearly dry soils they appear, as a rule, much smaller than in moist soils. They are blunt at the ends, and frequently contain unstained spores in varying number, which give them a beaded appearance that might be (and has been) mistaken for short torula chains of micrococci. The rods are sometimes slightly curved, and they frequently appear in pairs, forming a V-shaped figure; occasionally the rods are seen crossing one another. Often they appear within animal cells in tissues and other matters which they invade, quite isolated and scanty, so that there may be seen only a few bacilli, or only one bacillus, in a whole microscopic field. Sometimes they occur in large, dense masses, particularly so and most commonly within and around cheesy fragments met with in the contents of lung cavities, as Koch himself first pointed out.

It may be of interest to note that tubercle-bacilli may considerably multiply in sputum when it stands in a bottle for some time, as first observed by Bodamer in my laboratory. Williams, of the Brompton Hospital for Consumptives, records also that he has seen the bacilli multiply in sputum after standing in a room tor ten days.

For demonstrative purposes it is well to inspissate tuberculous sputum, or to dry it (as I have seen in Koch's laboratory); for examination it is then moistened with water, and it will then show more bacilli than when fresh.

The methods of detecting the bacillus are so well known that I will not consider in this communication the merits of the different dyes employed. Moreover, success does not depend upon the method or the dye, but mainly upon the skill and the accuracy of the dyer,[1]

As is generally known, the principle in staining bacilli rests upon the fact that bacteria absorb and retain aniline dyes more readily than do the surrounding animal organic materials which they inhabit. When sputum dried upon a glass cover, or a section containing them, is well stained, for instance by aniline violet, and then washed in very dilute nitric acid, only the bacilli will retain the dye, while all the rest of the organic material composing the specimen will be decolorized, and may readily be stained by some other dye without modifying the violet color of the bacilli.[2]

A magnifying power of four hundred diameters is

[1] The statements made by Beneke, Klebs, and Schmidt, that the bacilli are crystalline bodies, have been withd awn; while views to the effect that "bacilli" are to be identified with blood-fibrin, etc., were at no time taken into serious consideration by microscopists.

[1] To detect bacilli is a very simple matter, although by far not so easy as to prepare a specimen of urine and to find the all-important tube-casts; and yet how many physicians (even those perfectly familiar with microscopic technology) will be sure when they discover tube-casts, if they attempt to examine the urine at all?

[2] The staining fluids for bacilli we more commonly use are those after Ehrlich's formula, slightly modified;

nearly always sufficient to detect stained tubercle-bacilli. In fact, we found that where we failed to find bacilli with a good one-fifth objective, neither our one-twelfth Zeiss oil immersion lens nor the Abbé's condenser would reveal any when used (as we always do) for control. If the bacilli are very numerous (as sometimes in lymphatic glands), a mass of them may be recognized easily by the naked eye in a well-stained section as a small stained speck.

Occasionally bacilli may also be seen when unstained. Baumgarten[1] discovered the same tubercle-bacillus simultaneously with, and independently of, Koch, in unstained caustic potash preparations of tubercle-tissues. Koch[2] also states that tubercle-bacilli may be readily seen, especially in artificial tubercles when simply teased in water, or preferably in blood-serum. We have also observed tubercle-bacilli, without resorting to staining, in cultures such as chicken bouillon, identifying them subsequently by means of the usual staining process. In stained preparations too much washed in acid, or in specimens ill preserved, a part or all of the tubercle-bacilli may also be seen decolorized, though still quite distinctly visible.

Tubercle-bacilli are, as a rule, motionless as seen in stained preparations made from the substances they inhabit; but the observations of Bodamer and myself appear to show that the bacilli of Koch may also have an actual (not communicated) motion when for some time cultivated in liquid media. But at the same time, it was observed that the development of the cultures was not as extensive in liquid media (bouillon) as in a solid medium (coagulated blood-serum). Conversing with Koch on this point last summer, he remarked that this was quite possible, and suggested that perhaps the bacilli in their movable state acquire flagelli or cilia at the ends, although he had not yet made such observation. Koch, quite properly, does not seem to consider that motion is an invariably differentiating feature for bacteria.

In cultures (coagulated blood-serum being the preferable nidus) the tubercle-bacilli grow as a dry, scaly, tortuous, whitish-gray mass, spreading themselves exclusively on the surface. The growth is very slow, and is favored by a temperature of 30° to 40° C. (86° to 104° F.)

Dr. Koch kindly demonstrated to me a number of specimens of bacilli, and in particular the appearance of these bacteria exhibiting under low amplification the peculiar S-like figure in the growths in masses. Koch seems now to lay more stress upon this low-power appearance, and upon the pathogenetic properties of the bacillus tuberculosis, as a distinguishing feature from other bacilli, than upon the color test. During the conversation he admitted that some other bacilli may also yield the same micro-chemical reaction as the tubercle-bacilli, but insisted that the latter bacilli cannot be stained brown. The failure of the tubercle-bacilli to take the brown stain, he said, was the reason that they cannot be well photographed (blue- and red-stained objects not being suitable for photographing). He obligingly explained to me the details of his methods and the determination of the value of cultures. I learned from him that those cultures in which the bacilli have no spores are not capable of propagation, nor are they fit for inoculation of animals.

Klebs, to whom Koch had given some of his cultures of tubercle-bacilli, declared that they also contained micrococci. Kock presumes that Klebs has misinterpreted the granules of the coagulated blood-serum (in which they grew) as micrococci. I can testify that bacilli alone were present in those cultures of Koch which I had the opportunity of examining. This is also true of a bacillus-culture in a flat salt-dish obtained from Koch's laboratory by Dr. Shakespeare, of this city; this culture was still perfectly pure (and free of micrococci) when examined by Dr. Shakespeare and myself, three months after the arrival in America.

Concerning my own bacillus cultures which I recommended last autumn (and which are now more often successful than before I went to Berlin, through the use of the complete outfit of Koch's apparatus, supplied by the University of Pennsylvania) I will report later. But it may be said that, even under the most favorable conditions, to obtain success with the tubercle-bacillus culture is at times a difficult task.

Before leaving this part of the subject, I must say that I owe many thanks to the director of the German Imperial Board of health, Dr. Struck, and to Dr. Koch and his assistants, for the very liberal and kind treatment which they extended to me in their laboratory; also for allowing me to study the whole working of their famous institute, and demonstrating to me their methods of work, including the construction of their ingenious apparatus, and permitting me to exercise all the important manipulations in bacteridian studies after Koch's method; and, furthermore, for allowing me to prove that I had succeeded also in staining and recognizing the tubercle-bacillus before I went to them.

I cannot blame Koch for not demonstrating to me how to produce genuine induced tuberculosis with his bacillus within eight days, a favor which he extended only to Watson Cheyne;[1] not because I have not yet the "faith" in the infallible action of the tubercle-parasite, but because Koch was then working at the subject himself, and does not consider the task as much finished as his over-zealous followers do. I was, moreover, informed, while in his laboratory before leaving Berlin, that no one besides himself and

First Stain.—Watery saturated solution of aniline oil, five parts; alcoholic saturated solution of aniline violet, one part; mix and filter.

Second Stain.—Watery solution either of vesuvin or of Bismarck brown; filtered.

Direction for Preparation and Order of Staining.—Sputum in thin layer smeared upon glass cover and *well* dried; immerse (*a*) into first stain for twenty-four hours (rapid staining being not reliable in doubtful cases); (*b*) into dilute nitric acid (one to five parts of water) for two or three seconds; (*c*) wash in alcohol; (*d*) into second stain for two to five minutes; (*e*) wash in water and then in alcohol; (*f*) dry it and mount in Canada balsam or glycerin. Failures to detect bacilli will occur; first, when specimen consists of salivary mucus instead of expectorated material; second, when sputum too thick or too thin is smeared upon cover; third, when not enough heated in drying, or when burned; fourth, when too long in acid; fifth, when too much washed; sixth, when bacilli are absent; seventh, when not recognizing them.

For preparations to be kept, and for tissues, the fuchsine dye, as first stain, is preferable, and certain modifications of method necessary.

[1] *Med Centralblatt*, 1882, No. 15.

[2] *Berliner Klin. Wochenschr.*, 1882, No. 15.

[1] See *Practitioner*, April, 1883, page 249.

his assistants ever worked in the laboratory on the tubercle-bacillus beyond staining tissues, sputa, etc., containing it. Besides, the cultivation of the tubercle-bacillus takes a longer time than usually is allowed to outsiders who come to be instructed in Koch's laboratory.[1]

The Habitat of the Tubercle-Bacillus.—After reading most of the numerous compilations in reference to the present standing of the tuberculosis question, it would seem that Koch has established that his tubercle-bacillus is always associated with tuberculosis, and with the diseased products and the various excreta in this disease—and in this disease alone. Since Koch's publication appeared, a number of observers, authoritatively and otherwise, assert the invariable preseuce of the bacillus in *all* tubercular products; and, further, it is claimed as a proved matter that the bacillus is found in the beginning of the disease—viz., in the youngest tubercle-tissues.

This is, however, not in accordanee with the facts. Neither in Koch's own publication, nor in the records of any microscopist (when the original papers are examined), is the invariable presence of the bacillus in tuberculous lesions or excretions, and its absence in non-tuberculous matters, either clearly shown or proved. Moreover, the authors of nearly all the literary productions are in favor of the contagiousness of tuberculosis, and they disregard, as a rule, the negative evidence.

The question of the occurrence, and partly that of the significanceof the bacillus called by Koch the *tubercle-bacillus* in tuberculous lesions, divides itself into several parts, and hinges upon the results of the following investigations:

1. The examination of tissues affected by tubercular disease for the bacillus; and, if present, the time of its occurrence.

2. The examination, *intra vitam*, of blood of tubercular patients.

3. The examination of the products discharged or eliminated with the excretions by individuals suffering from tubercular disease.

4. The examination of air,—viz., of the breath of phthisical patients, and of the air of sick-rooms and hospitals generally.

5. Comparative studies in animal tuberculosis.

6. The occurrence of bacilli in lesions and substances other than tubercular.

I will state now, briefly, what so far have been the results of the investigations upon these points.

1. Tubercle-bacilli have been detected quite often in the various forms of tubercles of lung, and in scrofulous and tuberculous lymphatic glands; and likewise, although not so frequently, in tubercles of the various serous cavities; and in tubercular ulcerations of the mucous membranes and the skin. But it must be noted that only a few microscopists have recorded examinations of tubercle-tissues for bacilli, and among these there was *not one* who did not meet with a case or a certain number of cases in which tubercle-bacilli were either totally absent in the tissues, or only present in some of the tubercles. The great bulk of bacillus work done comprises merely examinations of sputum.

The facts concerning bacilli in tissues are as follows:

Koch[1] found bacilli in the majority of tuberculous lesions he examined, but still not in all, as he states himself: he only *supposes* that his bacilli, even if they escape observation, are still present in all cases and in all tubercles. His proposition, however, that in some tuberculous lesions only unstained spores of tubercle-bacilli are sometimes present, or that bacilli may be invisible, and not taking the staining when dead, or even may be absent if the tuberculous process comes to a "stand-still," is, of course, purely hypothetical. There is still another good reason for the assumption that the proportion of non-bacillary tubercles may be much larger in Koch's own examinations. As Koch says himself, he preëminently recognizes only such structures as tubercular which contain his bacillus, regardless of their morphology otherwise; it is therefore possible that he may have innocently excluded a number of non-bacillary tubercles from the list of his tubercle records. Koch himself, however, says that he failed to detect bacilli in some scrofulous glands, and in two cases of tubercular synovitis, and further admits the prevalence of bacilli in degenerated tissues.

As far as examination of tubercle-*tissues* for bacilli is concerned, only the following observations besides those of Koch are recorded (so far as is known to the writer), and with the following results:

Dr. Geo. M. Sternberg, U.S.A.,[2] who is a man recognized as a competent mycologist, here as well as in Europe, failed to find tubercle-bacilli in the lesions of several cases of tuberculosis.

Heneage Gibbs[3] also failed to discover bacilli in a number of tubercles, particularly in the reticular form; in fact, he had met several times with non-bacillary tuberculosis. Gibbs states[4] that "he had examined the lungs of guinea-pigs which had become tuberculous after being kept in the air-shafts of the Brompton Hospital for Consumptives, and had found no bacilli in them; and he knew of an instance in which a guinea-pig, inoculated with sputum from a case of phthisis, presented a glandular abscess in the thigh which abounded in bacilli, whereas the internal organs, although full of tubercles, did not yield a single bacillus."

I do not think it is likely that Heneage Gibbs, with his large experience and universally recognized skill in bacteria-stainings, would fail to discover bacilli if they had been present.

[1] I found that the "pilgrims from all nations" who (through influence brought to bear upon the authorities) succeed in being admitted for a while to Koch's laboratory, are instructed principally in the most rudimentary manipulations of mycology; and to most of them the assistants have first to point out what a bacterium looks like. Besides these "pilgrims," the German Government sends regularly young sanitary officers to be instructed in mycology. Of course this is a very useful matter to the "pilgrims" and to the young sanitary officers, even if only one out of twenty-five ever devotes himself to mycology; but it is no beneficial matter to Koch and his kind assistants, who, through this constant interruption, are terribly interfered with in their scientific work. In fact, the working of the Imperial Laboratory is sometimes completely delayed in this way, as it was last summer, during the Hygenic Exhibition. Yet the beneficial influence upon sanitary science which this excellent institution exerts is very great.

1 Berliner Klin. *Wochenschr.*, No. 15, 1882.
2 Phila. *Med. News*, 1882.
3 London *Lancet*, February 24, 1883.
4 *Lancet*, February 12, 1883.

Watson Cheyne,[1] whose anatomical conception of tubercle is inseparable from the bacillus, of course says that non-bacillary tubercles, like the above, are no tubercles at all. Hence his statement, that in all tuberculous structures (that is, in all structures which *he* calls tubercle) the bacilli are invariably present, is, from his standpoint, perfectly warrantable. He also confirms the fact that recently-formed tubercle-nodules made up of young lymphoid cells are, as a rule, without the bacilli, while the older tubercles, always containing epitheloid cells (on account of retrograde changes), usually do contain bacilli. Now, Watson Cheyne, in this connection, with great self-confidence propounds, "The bacilli being the cause of this disease (tuberculosis), only the nodules containing epitheloid cells are tubercle."[2] Still, the same writer has expressed surprise[3] that "very extensive tuberculous processes may be found in animals with only very few bacilli."

T. M. Prudden, of New York,[4] who made extensive and excellent morphological studies in reference to the occurrence of the bacillus in tuberculous lesions, *failed to find bacilli in any part of the body in three cases of profuse tuberculosis.* In one case of Prudden's, the tubercle-bacilli were abundant in the walls and edges of a lung cavity and its immediate vicinity, while no bacilli could be found in the diffuse and miliary tubercles of the rest of the body. Prudden further states, "In a large proportion of the cases in which bacilli were present; they seemed to have a decided predilection for tubercle-tissue in a degenerated and disintegrating condition, either cavities in the lungs, cheesy and breaking-down areas, or tubercular ulcers; although present with great frequency in small numbers in well-formed, intact tubercle-tissue. * * * The bacilli were present in greater abundance in the respiratory organs and intestinal tract than in other parts of the body less directly in communication with the external world. It is further evident that in nearly every case there are many miliary tubercles of all forms, and in many cases much diffuse tubercle-tissue, from which the bacilli appear to be entirely absent."

Spina[5] did not succeed in detecting bacilli in a number of cases. Even if the number of Spina's failures to see the bacillus should be larger than in cases of other observers, Koch's favorite demolishing argument that Spina and all others who failed to detect the bacillus in any case do not know *what* that parasite of his looks like, is entirely unjustifiable. Moreover, Spina's work was controlled by no less an authority than Stricker, of Vienna, and the correctness of the results of the investigation in its essential parts is vouched for by Stricker.

Cornil and Babés[6] detected the bacillus in the lesions of a number of cases of tuberculosis; but they also showed that bacilli are totally absent in some cases, and not constant in otherwise typical tuberculous lesions.

[1] *Practitioner*, April, 1883.
[2] See p. 309, loc. cit.
[3] Page 316.
[4] *Medical Record*, April 14, and ibid, June 16, 1883.
[5] Studi n über Tuberculose. Wien, 1883.
[6] *Le Progrès Médical*, 1883.

Malassez and Vingal,[1] from the results of observations of their own, state that there seems to be no doubt that true tuberculous lesions occur which possess very few or even no tubercle-bacilli.

Fräntzel,[2] in a discussion before the Berlin Medical Society, stated that he found a number of scrofulous (tuberculous) ulcers and lymph-glands not to be "bacillary."

C. Macnamara[3] reports a case of primary tuberculosis of bone and of the marrow of bone, in which no trace of tubercle-bacilli could be discovered in any of the lesions.

George Bodamer, having succeeded in staining and demonstrating the bacillus in sputum and in tissues in the spring of 1882 (immediately after the announcement of its discovery and the method of its staining by Koch, and probably prior to any one else in America), and having worked together with me nearly incessantly in bacillus stainings and cultures ever since, (including also a certain time in the pathological institutes in Germany), also failed to detect the bacillus in a certain number of typical tuberculous lesions of various kinds.

As will be seen from my report, I found tubercle-bacilli to be absent (or I could not detect them, if this expression should be preferred) in four cases of primary peritoneal tuberculosis, in two cases of primary tubercular pericarditis, in one case of tubercular joint-disease, and in several cases of miliary tuberculosis; this does not include some cases of induced animal tuberculosis which did not show bacilli.[4]

Dr. Lawrason, of New Orleans, who worked with me last spring in the pathological laboratory of the University, and who had demonstated his skill in staining bacilli in tissues before the Pathological Society of Philadelphia and elsewhere, also found tubercle-bacilli wanting in some of the most typical tuberculous lesions.

Weigert, Bollinger, Baumgarten, Ziel, Councilman, Schuchart, and Krause, and Koch's own assistants, are yet to be mentioned as having recorded a few examinations of tuberculous tissues for bacilli with negative and varying results; but detailed statements of their investigations in this direction are not known to me.

The direct conclusion to be drawn from the total evidence relating to bacilli in *tissues* just quoted is, that tubercle-bacilli are not invariably present in even typical tuberculous lesions; furthermore, that none of the investigators brought forward any proof or evidence that the bacilli are present or appear in the beginning of the disease. On the contrary, the results of the investigatons of all observers, including those of the discoverer of the bacillus himself, point plainly towards establishing the fact that tubercle-bacilli inhabit preëminently disintegrated tissues.

2. *Examinations of the blood and lymph intra vitam* of patients suffering from tubercular disease, which

[1] *Le Progrès Médical*, No. 20, 1883, and in a second communication quoted by the *Lancet*, Dec. 15, 1883.
[2] *Berliner Klin. Wochenschr.*, December, 1883.
[3] *Brit. Med. Journal*, Dec. 15, 1883.
[4] At this point I wish to correct an impression which a certain statement in one of my former communications on this subject seemed to convey—namely, that bacilli are invariably present in tuberculous products.

in my opinion would be quite an important matter in the study of tuberculosis, are not recorded by any observer. All attempts which we made in examining the blood of tuberculous patients during life gave, as will be recorded later, negative results. It is true that we observed in specimens post-mortem some blood-vessels filled with thrombi containing a few bacilli. Further, there are records by Cornil, Weigert, Ponfick, and Koch relating to bacilli observed post-mortem in the walls of veins, of large lymph-ducts, and of arteries, in tuberculous cases. As to the route and manner by which the bacilli gained entrance to these places, inferences might be drawn, but no definite conclusions arrived at until the bacilli have been observed during life in the blood or lymph. I will not touch upon this part of the question at present.

The blood from cases of hæmoptysis as expectorated has been examined by Hiller[1] and Williams,[2] and bacilli discovered, but no inference from this can be made as to the bacilli in the circulating blood.

3. *Examination of products discharged or eliminated with the excretions* by individuals suffering from tuberculosis has been practiced quite extensively, and by a number of observers especially in reference to phthisical sputum. To these sputum-examinations I will return immediately.

There are a few investigations recorded in reference to tubercle-bacilli in the fæces, in discharges from the ears and in those from the nose, and in urine voided by patients affected with local tuberculosis of the pertaining parts. Tubercle-bacilli were often detected, and thus a diagnosis of tubercular enteritis, tubercular otitis, and tubercular meningitis, (if bacilli in nasal discharge) and tuberculosis of the urinary tract, was made.

The tuberculous nature of ulcers, of synovitis, and of surgical lesions of various locations, it is claimed has been occasionally settled (?) in this way.[3] But, on the other hand, the discharges from some typical tuberculous lesions failed to show bacilli.

Damsch[4] claims that tuberculosis of the genito-urinary tract can be diagnosticated by inoculating a drop of urine from such a case into the anterior chamber of the eye of a rabbit, which operation will be followed promptly by iris tuberculosis in the animal. This latter observation, however, I believe, requires confirmation.

The examinations of sputum, practiced now probably by all microscopists in the world, proved to be of much more value. I will quote the observers who made and recorded more or less extensive examinations of sputum, and the results and conclusion they arrived at, to show that there are some points which are misinterpreted by some clinicians and others.

Koch[5] does not claim that sputum from every phthisical case contains bacilli; he met with cases without bacilli in sputum. He did not find, however, bacilli in cases said not to be tubercular.

[1] *Deutsche Med. Wochenschr.*, No. 47, 1882.
[2] London *Lancet*, Feb. 24, 1883
[3] Schuchart and Krause, in Volkmann's Clinic, Chirurg. Centralblatt, 1883
[4] Deutsch. Arch. f. Klin. Med., 1882.
[5] Loc. cit.

Ehrlich[1] records twenty-six cases of phthisis in which bacilli were invariably present in the sputum; in other lung affections similar bacilli were not found.

Balmer and Fräntzel[2] examined one hundred and twenty cases of phthisis for bacilli with positive results, and came to the conclusion that the quantity of bacilli was in direct proportion to the gravity of the disease, and that the bacilli were larger and often contained spores in acute cases, and were smaller in size and quantity in chronic cases. They never saw bacilli in the sputum of cases other than phthisis. They also quite properly conclude "that the sputum affords to bacilli a more favorable place of growth than does the still living lung-tissue," because they found bacilli to be extremely scanty in the tuberculized lung-tissue surrounding a cavity, while the contents of the latter and cheesy degenerated parts of the lung were crowded by them.

Heron[3] records sixty-two cases of examination of phthisical sputum, in which bacilli were constantly present.

D'Espine[4] records examinations of sputum from twenty-five cases, but could not confirm the correctness of the assumption that the bacilli stand in any relation of quantity to the gravity of the disease, although he affirms that they are constantly present.

Williams,[5] having examined the sputum of one hundred and thirty cases for bacilli, with only three negative results, concludes, however, that there was "no definite ratio between the activity of the disease and the number of bacilli, although they were few in cases where the disease was quiescent."

Kowalsky[6] claims to have examined the sputum of six hundred cases of phthisis, with bacilli nearly invariably present.

Chiari,[7] in a number of cases examined, never failed to find bacilli.

Fiehl[8] found bacilli in the spntum of seventy-three, Doeschfeld [9] of forty-six, and Gradle and Woltmann[10] in thirty-five consecutive cases of phthisis examined.

Detwiler and Meissen[11] examined eighty-seven cases of phthisis, finding bacilli in all but two. Although bacilli were more numerous wherever great destruction of lung tissue existed, they did not observe any definite ratio of bacilli in sputum to the gravity of the disease. The presence of elastic tissue in sputum they consider as significant for diagnosis, and as constant as that of bacilli.

S. West[12] found bacilli present in every case of phthisis which he examined, though in some cases they were present in such small numbers as only to be found after repeated and very careful examination. He further adds: "The more cheesy matter or fluid from a cavity there was in the expectoration, the more bacilli we might expect to find; consequently, in a

[1] *Deutsche Med. Wochenschr.*, No. 19, 1882.
[2] *Berliner Klin. Wochenschr.*, No. 45, 1882.
[3] London *Lancet*, Feb. 2, 1883.
[4] London *Lancet*, Jan. 13, 1883.
[5] London *Lancet*, Feb. 24, 1883.
[6] Wien. *Med. Presse*, Feb. 24, 1883.
[7] Ibid., No. 1, 1883.
[8] *Deutsche Med. Wochenschr.*, No. 5, 1883.
[9] *Brit. Med. Jour.*, Feb. 17, 1883.
[10] *Med. News*, Feb., 1883.
[11] Berliner *Klin. Wochenschr.*, Nos. 7 and 8, 1883.
[12] London *Lancet*, Feb. 10, 1883

case of acute tuberculosis, before breaking down of the lung, we should expect to find none." He also states that there seemed to be but little variation in the size of the individual bacilli in different cases, although bacilli in acute cases appeared to contain spores.

R. S. Smith[1] records seventy-seven cases in which he had made the examination of sputum; of these, forty-nine were from "tubercular phthisis," and invariably showed bacilli; the remaining twenty-eight, comprising various other affections of lungs, some of them closely simulating phthisis, did not show bacilli. The affections examined with negative results were such as "chronic bronchitis, bronchiectasis, chronic syphilitic pneumonia, slight hæmoptysis with no evidence of any disease, chronic pleuro-pneumonia with dulness on percussion and copious purulent expectoration, chronic pleurisy, apex pneumonia with subsequent breaking down from gangrene and with cavity (?), sarcoma of lung, gray hepatization, congestion from mitral disease, diabetes with bronchitis, two cases with strong family history of phthisis, cough with purulent expectoration, but with no evidence of local disease in lungs," etc. Bacilli were also wanting in "slight phthisical cases when the patients were rapidly recovering." I think, however, that errors in physical diagnosis can by no means be fully excluded here.

Heneage Gibbs,[2] from his extensive observations, states that the sputum did not show bacilli in some cases which upon the autopsy-table showed the lungs riddled with tubercular masses: he explains that the patient died before the destructive process had gone far enough to cause the bacilli to be ejected.

Whipham[3] records twenty cases which he studied in relation to bacilli in sputum, and made the observation that the bacilli disappear from sputum at times when the condition of the patient improved.

The report upon the examinations of sputum for bacilli from the pathological laboratory of the University of Pennsylvania will embrace the results from nearly two hundred cases of pulmonary diseases observed. These show that bacilli in sputum are diagnostic, but not prognostic, in phthisis; that the old-fashioned test, the presence of pulmonary elastic tissue in sputum, is a very reliable one (gangrene and abscess being so easily excluded); and, further, that the absence of tubercle-bacilli in sputum proves nothing.

Spina and Stricker[4] met tubercle-bacilli in simple bronchiectasis, bronchitis, croupous pneumonia, etc.

Sattler, in the translation of Spina's book,[5] page 164, adds the record of an autopsy of a case of similar nature mistaken for phthisis on account of bacilli in sputum.

Kundrat[6] related a case which occurred in the spring in Nothnagel's clinic, where a diagnosis of tuberculosis was based upon the detection of bacilli; but, post-mortem, the case proved to be one of chronic catarrh with bronchiectasis. He also mentioned a case, under Prof. Schrötter, where bacilli were repeatedly found by himself and others, and the necropsy showed only bronchitis and emphysema. Hence, he was not disposed to admit that the discovery of bacilli in the sputum was absolutely diagnostic of tubercle.

Riegel, of Giessen, and others, failed to find bacilli in the sputum of cases of diabetic phthisis. But I think the diabetes had nothing to do with keeping the bacilli out, as I have detected multitudes of bacilli in the sputum from a case of diabetic phthisis observed and confirmed by autopsy by Dr. Charles H. Reed, of this city.

Levinsky[1] and Koryanyi[2] both detected tubercle-bacilli in the sputum of patients with syphilitic lesions of the lung.

It is very probable that many of the cases of pulmonary disease in which bacilli were not discovered might nevertheless have been phthisical: in fact, the character of the control cases, as given by R. S. Smith (quoted above), fully justifies such assumption. From the autopsy-experience of clinicians and pathologists whom I consulted, and from observations of my own, I can testify that the only sure way to decide the nature of doubtful cases, such as, for instance, those recorded by Smith, is the autopsy: otherwise the negative evidence in relation to bacilli goes for naught, This is also substantiated by the observations of Gibbs, Whipham, and West, quoted above, viz.: that bacilli may fail to appear in sputum where there are no cavities and no ulceration in the lung. I have seen autopsies reveal phthisis in cases where no bacilli were found during life, after careful examination over and over again repeated; and I also happened to witness the autopsies of three cases of non-tubercular lung disease which during life had been diagnosticated phthisis on account of bacilli discovered in the sputum.

The examination of sputum may thus, in doubtful cases, be quite misleading; for if, in any given case, bacilli are not found, it should be taken into consideration, *first*, that the bacilli may be enclosed in the tubercle-tissue, as in miliary tubercle, which rarely produces destruction of the lungs, and consequently they may fail to appear in the sputum; and, *second*, that the examiner may fail occasionally in any case to succeed in preparing a successful preparation of stained bacilli. On the other hand, if bacilli are present, they sometimes may not be pertaining to the case, but be accidentally introduced through use of a vessel uncleansed and used by another patient, or otherwise; and, finally, it may be inferred, but it is by no means proved under rules of scientific scrutiny, that similar bacilli do not occur in the sputum of cases other than tubercular.

From our present knowledge of the occurrence of Koch's bacillus in sputum we must therefore conclude:

1st. That the presence of bacilli is a valuable *diagnostic* sign of tubercular disease of the lung.

2d. That the quantity of bacilli found does not, as

1 *British Med.-Chirurg. Jour.*, July, 1883.
2 London *Lancet*, Feb. 24. 1883.
3 Ibid., Feb 10. 1883.
4 Loc. cit.
5 Cincinnati, 1883.
6 Discussion before the Vienna Medical Society, *Wiener Med. Presse*, 1883.

1 *Deutsche Med. Wochenschr.*, No. 11, 1883.
2 *London Med. Record*, March 15, 1883.

a rule, indicate the degree of the disease, and hence is *not a prognostic sign.*

3rd. That the absence of tubercle-bacilli is *no proof whatsoever of the absence* of tubercular disease.

4th. *The examination of air*—viz.: *of the breath of patients* suffering with pulmonary tuberculosis, and of the air of sick-rooms and hospitals generally—has given some positive, although not definite, results.

C. Theodore Williams[1] "recently selected one of the ventilation-shafts at the Brompton Hospital for Consumptives in which the flues of several wards converge, and in which extraction takes place at the rate of three hundred to four hundred feet a minute. In this current he suspended glass plates smeared with glycerine for a period of five days. The plates were then washed with distilled water, the fluid mixed with a little mucilage and evaporated down to half, and the residue tested for bacilli, which were found in fair abundance."

R. C. Smith[2] "succeeded in demonstrating bacilli in the breath of consumptive patients by making them breathe through two thin sheets of gun-cotton placed in the outer compartment of an ordinary respirator. This layer of cotton is then converted into collodion, run in thin films on slides, and stained for bacilli."

A. Ransome,[3] on examining the breath of several advanced cases of phthisis, fouud specimens of bacillus in two cases, while in several other cases the organism was not found, and it was not found in the aqueous vapor condensed in the waiting-room of the Manchester Consumption Hospital. The collections had been made by exposing cover-glasses smeared with fresh white of eggs or a little mucus for a certain length of time. Gibbs' method was used in staining.

Celli and Guarneiri[4] made similar examinations with quite different results. They were unable, after the most careful search, to find tubercle-bacilli in the air of an unventilated room in which phthisical patients had been sleeping. The expired breath of those patients was likewise found to be entirely free from bacterial contamination. Nor could the tubercle-bacilli be discovered in air which had been passed through the sputa of tuberculous patients, although in every case the expectorations were found to contain them in large numbers. (They were also unsuccessful in attempts at inoculation with fluids impregnated with this presumably vitiated atmosphere).

Profs. Sarmoni and Marchiafava[5] examined the breath of a number of phthisical patients for bacilli, with absolutely negative results. (They conclude that phthisis is not directly contagious, but might be indirectly so by means of dried, powdered sputum, which floats as dust in the air).

V. Wehde[6] made, under direction of Bollinger, in Munich, the following experiments in relation to examination of air. Plates smeared with glycerin were exposed for forty-eight hours in closed roms in which there were a number of advanced acute cases of phthisis. No bacilli could be found after applying the usual tests in an appropriate manner. (He further testifies that after injecting the material collected, as above stated, into the peritoneal cavity of eleven rabbits and guinea-pigs, no tuberculosis was produced).

5. *Comparative studies of animal tuberculosis.*—Spontaneous animal tuberculosis is unquestionably identical with human tuberculosis. There are a few morphological specializations, which I mentioned in a former chapter,—*e. g.*, in tuberculosis of birds and in bovine tuberculosis or pearl-disease; but the essential, peculiar histological features are the same in all. Tubercle-bacilli appears also to be present in nearly all cases of spontaneous animal tuberculosis. I detected bacilli in a tuberculous bronchial lymph-gland from a phthisical tiger, which I had kept in alcohol for eight years, and in one from a monkey of more recent date; and several times I found bacilli in spontaneous bovine, chicken, rabbit, and guinea-pig tuberculosis. I also studied tuberculosis in the bear, lion, leopard, and in a large variety of apes (dead of typical consumption, from the Zoölogical Garden), with results identical with those obtained from studies in man. But this was long before the "outbreak" of the "bacillary campaign," and consequently Koch's parasite was not looked for in these latter cases.

Bollinger[1] found bacilli in the udder of a cow affected by pearl-disease (bovine tuberculosis).

There are no observations on record concerning the occurrence of tubercle-bacilli in the excretions and the manure of animals affected by tuberculosis (sputum is not produced by animals),—not even any reliable observation of bacilli in the milk.

Artificial or induced tuberculosis in animals will be considered in connection with the experiments farther on.

6. *The occurrence of bacilli in lesions and substances other than tubercular.*—Bacilli not distinguishable from tubercle-bacilli are met with in lupus and leprosy. The bacillus met with in lupus is unquestionably identical with the tubercle-bacillus, as is evident from the investigations of Max Schüller, Pfeiffer,[2] Dontrelpont,[3] and Babès and Cornil.[4] Yet the dermatologists are hardly inclined to recognize lupus and tubercle as inseparable, there being already a defined tuberculous lesion (the scrofuloderm) on the dermatological list, and, further, they refuse to identify the two lesions on clinical and anatomical grounds.

The bacillus of leprosy, in specimens which I had the opportunity to examine, appears to me also perfectly identical with the small forms of tubercle-bacilli; although the lepra-bacillus may perhaps look more sharp-pointed to the eyes of others, and may fail to take the brown stain. There is nothing surprising in the fact that the same species of bacillus

[1] Quoted from the London *Lancet*, July 28, 1883.
[2] *British Medical Journal*, Jan. 20, 1883.
[3] *British Medical Journal*, Dec. 16, 1882.
[4] Quoted by the New York *Record* from the *Gazzeta degli Ospitali*, No. 56, 1883.
[5] Annali Universali di Medicina, Sept., 1883.
[6] Prager *Med. Wochenschr.*, Jan., 1884.

[1] *Centralblatt f. d. Med. Wiss.*, August 18, 1883.
[2] *Deutsche Med. Wochenschr.*, No. 19, 1883.
[3] *Monatsheft f. Praktische Dermatologie*, No. 6, 1883.
[4] Loc. cit.

inhabiting soils of different character and different chemical composition, perhaps, may acquire varying micro-chemical properties and slight modification in shape. The experiments of Damsch[1] further suggest the identity of leprous and tubercle-bacilli in their effects. There is no reason to believe that leprosy is a variety of tuberculosis, yet we must either declare lupus, leprosy, and tubercle to be identical lesions, or else declare the tubercle-bacillus not to be peculiar to tuberculosis.

I observed bacilli not distinguishable by the shape and micro-chemical tests from tubercle-bacilli in the false membranes in two cases of diphtheria, and in one case of scarlet fever with extensive pseudo-membranous angina. Two of these cases proved fatal; the autopsies did not reveal tuberculosis in any part of the body. The false membrane was prepared by crushing it between two cover-glasses, and was treated like sputum.

In syphilis of the lung the cheesy material and the sputum (as above stated) was found to contain tubercle-bacilli by Levinsky,[2] and also by Koryanyi.[3]

Lichtheim[4] and Craemer[5] may be mentioned yet in this connection, as having each found the tubercle-bacilli, or bacilli like them in every respect, in the fæces of a number of non-tuberculous patients, as well as in the tuberculous. This is, however, energetically contradicted by Gaffky, of Koch's laboratory, on the ground that he (Gaffky) failed to discover in fæces of normal persons in Berlin any bacilli which reacted to micro-chemical tests like tubercle-bacilli.

The discovery of Professor Bologh[6] that bacilli similar to tubercle-bacilli are found in the marshes around Pesth, Koch also tries to demolish by the statement that such bacilli were not detected in the mud of a Berlin city canal.

In sections of phthisical lungs I often observed masses of bacilli in those portions which were without tubercles, but which were affected secondarily by simple acute inflammatory changes, and the air-vesicles merely stuffed with exudate undergoing rapid disintegration (coagulation necrosis); while the real tubercle-tissue contained no bacilli, or sometimes only a few in the giant cells. I think Prudden[7] also noted this.

Surveying now the whole question of the habitat of the bacillus tuberculosis, it becomes evident that Koch's dogma—that only that is tuberculosis, and everything is tuberculosis, where his bacillus is found—is overdrawn and cannot bear criticism. It would be much safer to reverse this proposition, and to *consider that bacillus alone a tubercle-bacillus which inhabits evident tubercular lesions* or their products,—*e. g.*, sputum, and nothing else. For we have no difficulty in diagnosticating under the microscope a tubercle without the bacillus; but *a dilemma arises at once if we see questionable bacilli without the tubercle, or outside of sputum.*

[1] *Centralblatt f. d. Med. Miss.*, July 21, 1883.
[2] Loc. cit.
[3] Loc. cit
[4] Fortschritte der Med., vol. i, 1883.
[5] Sitzungsbericht der Societät in Erlangen, December 11, 1882.
[6] *Wiener Med. Mochenschr.*, No. 51, 1882.
[7] Loc. cit.

VI.—EXPERIMENTS AND EVIDENCE, "PRO" AND "CONTRA."

It has been shown that the clinical evidence in reference to the contagiousness of phthisis is so meager that assertions as to its parasitic origin are unwarranted. (see chap. iv.) Moreover, statistics negative such theory. This being the case, it would seem as if experimenters are trying to prove that which is not the reality.

The testimony of the defenders of this theory, however, appears strengthened since the publication of the discovery of the bacillus and of the experiments of Koch. This is to be in a measure explained by the impression which Koch's well-constructed article made upon the minds of some of our leading clinical teachers, who involuntarily felt themselves induced to teach and to write about the doctrine of the contagiousness of phthisis. The profession at large does not care for Koch's discovery, whatever its value may be; but the opinion of the leading clinicians endorsing such discovery forms a guide, and may prove one of the most efficacious means of influencing the profession in regard to the question of the contagiousness of phthisis.

Having arrived, from my own experiments, at conclusions different from those of Koch, I thought it at present timely to announce at least the results of my observations, as my detailed report can not appear for some months to come. It is my personal observations, together with my conclusions obtained from a careful perusal of the control experiments and of the records of the observations of others, which have determined my present attitude in the question of the ætiology of tuberculosis.

The total evidence *pro* and *contra* gives me the impression that the doctrine of the contagious character and parasitic causation of tuberculosis can not be sustained.

I will now submit a brief analysis and summary of experiments made and evidence offered in relation to the question of the parasitic origin and specific nature of tuberculosis.

For the establishment of a theory in regard to a parasitic origin of a disease by means of experiments on animals, etc., the following propositions must be affirmatively decided:

1. The disease produced experimentally in animals by means of inoculation with products of the human disease, must be proved to be identical with the disease occurring spontaneously in man.

2. There should be some evidence showing that inoculation in man is followed by the same results as follow the inoculation of the same material in animals; and that the disease is really contagious.

3. There must be found a definite parasite at the beginning of the diseased process in all cases, and in all tissues involved by the disease, and in sufficient quanity to account for the changes.

4. Given a parasite that is the cause of the disease, its action should be specific, *i. e.*, it alone should be the causative factor, and should, when isolated and inoculated into an animal liable to the disease, always produce that disease.

5. The lesions of a disease resulting from the inoculation ot a specific parasite must also contain that parasite, and the specific properties of reproducing the same disease when re-inoculated.

6. Finally, a given parasite and no other substance should, the conditions remaining the same, be capable of producing the disease.

Koch makes an effort to answer all the above propositions in the affirmative in reference to tuberculosis. As a thorough and experienced mycologist, he knew that this is unavoidably necessary in order to establish the ætiological relation of his bacillus to tuberculosis.

Tuberculosis was known before Koch to be inocuiable, and was, upon popular notions and traditionally, regarded by some as a contagious disease. Taking such theory for granted, it was necessary to find the parasite. In fact, Klebs, Toussaint, Max Schüller and Aufrecht made excellent investigations, which even suggested the parasitic nature of tuberculosis, although the proofs offered by these investigators were not sufficient.

Koch's investigations, with his superior advantages, methods and diligence, have been crowned with better success, and have brought forward facts of standing and permanent value to mycology, botany, and partly to medicine. His evidence in the question of the parasitic nature of tuberculosis is strong, but his conclusions from this evidence were overdrawn and too hasty. They are, thus far, not so much justified as he and his followers think they are. There is great lack of that absolute proof that is necessary for the settlement of a question of such magnitude and social importance.

Koch has, in relation to tuberculosis, brought forward definite affirmative proof for only some of the above-named propositions, and this, again, *only partial*. Valuable contributions to this end have been also made by others. But we must have *full proof for each and all* of those propositions, and these must be really applicable to tuberculosis, before we can accept the theory of a parasitic character and of the contagionsness of this disease.

Submitting now, a brief criticism of the bacillus theory of Koch and his followers, I will take up separately each of the above-stated propositions, all of which it is necessary to prove in the affirmative before there is any reason for the establishment of such a theory in regard to tuberculosis.

1. *The disease produced experimentally in animals by means of inoculation with products of human disease, must be proved to be identical with the disease occurring spontaneously in man.*

In favor of the identity of human tuberculosis with that produced experimentally in animals there has been brought forward the fact that the products in both contain identical bacilli. But this surely does not prove the identity, because similar bacilli may be found in the lesions of various kinds of processes, resulting in cheesy products. (See bacillus chapter.) Besides, there are many spontaneous and artificially-induced tubercular lesions in which bacilli could not be demonstrated. Hence, we can not rely upon the bacilli as a proof for the identity of the lesions.

Koch, and those who imitated his experiments, diagnosticate and declare all those artificially-induced lesions as tubercular which occur in nodes and in which they found the tubercle-bacillus, without taking (so far as I know) into consideration any structural peculiarities or other conditions. Now, tubercle-bacilli will surely be found in the lesions, whatever these may be, as they were introduced into the animal in those experiments. Further, in the opinion of these gentlemen nothing is tubercle where there are no tubercle-bacilli. Therefore, how can we rely upon their statements as to what the lesions they induced in animals really were?

It is hardly within the province of the mycologist to teach us what is tubercle and what is not tubercle.

Tuberculous lesions with extensive cheesy changes and tissue-destruction, cavities, etc., such as occur spontaneously and often quite speedily in man or animals, cannot be induced experimentally by means of inoculation, unless very large quantities of some purulent tuberculous materials are used, and abscesses result. When an animal dies several or many months after the operation of natural tuberculosis, extensive caseation of the organs may occur.[1] The only kind of induced or artificial tuberculosis in animals which may be ascribed to the effects of inoculation is one that corresponds in naked-eye appearance to secondary miliary eruption of tubercle as occurring in man—the acute miliary tuberculosis. This acute miliary tuberculosis in man, which I observed also in animals as a syontaneous disease, occurs only in wasting diseases accompanied by various grave symptoms, anæmia, and great emaciation; while the induced disease in animals occurs suddenly, and induces no symptoms, no blood-changes, no emaciation, etc.

In many instances where the experimenters have produced, by means of tuberculous materials, within two to eight days after the operation, a miliary eruption, it is not probable that those miliary nodes were tubercles, and were due to the effects of bacilli, which are known to grow extremely slowly, and it is not certain that the experimenters took pains to distinguish them from true tubercle, or were competent in all instances to do so. This is eminently true of the inhalation tuberculosis.

Tappeiner's induced inhalation tuberculosis ot dogs,[2] so much relied upon by Koch and others for the establishment of the mode of the spreading of phthisis, and partly of the bacillus doctrine itself, has been proved to be a fiction. Tappeiner, as so often quoted, subjected dogs to an atmosphere heavily charged with phthisical sputum, so that the dogs were nearly bathed in the latter (known to contain bacilli, for weeks. But, in spite of this, the animals grew fat, if anything, and, after the lapse of a certain

[1] I was much surprised last summer to see in Berlin, at the Hygienic Exhibition, in Koch's pavilion, specimens of the character just stated exhibited as inoculation-tuberculosis, and still more to hear the demonstrator explain (surely without being authorized by Koch) that these specimens were to demonstrate the rapid effects of the bacillus.

[2] Virchow's Arch., lxxiv, 1878, and ibid, lxxxii, 1880.

time, acquired local pulmonary affections in the form of nodules, not likely to have been tubercular in nature, of which only in one case were some observed in the liver and kidneys.

The experiments of Schottelius,[1] Wargunin and Rajewsky,[2] Weichselbaum,[3] and of others,[4] and my own experiments also (to be reported subseqently), make Tappeiner's assertions perfectly untenable. Tappeiner's own account of his experiments, and the microscopical description of the structure of Tappeiner's "tubercles," by Grawitz and Friedlander in Virchow's institute, clearly indicate that he had nodular broncho-pneumonic foci, and not tubercles. (See explanation of these formations in the first chapter of this paper.)

I will, however, show later that pulmonary tuberculosis may occasionally be produced in rabbits by these means.

Furthermore, the bacillus theorists assert that inoculation-experiments, and these alone, can prove the tubercular nature of the nodular eruptions obtained artificially in animals. The identity with human tubercle is considered established, because inoculation nodes from the animal and tubercles of man act alike. They claim that whatever can produce tubercle on inoculation contains the tubercular virus, and is tubercle. Under such conception, finely-powdered sterilized glass should be classed with tubercle, because it, as I can reaffirm now, is capable of inducing tuberculosis when introduced into the tissues of healthy animals.

The following deserves a passing mention. According to Orth[5] and Bollinger,[6] there is some doubt as to the identity of human and animal tuberculosis. The results of the experiments of both these observers show that tuberculosis could only be induced by feeding animals with materials from animal tuberculosis; while tuberculous materials taken from man had no effect upon animals when given as food. On the other hand, the Würzburg feeding experiments upon man[7] prove that animal tuberculous materials have no effect on man.

Although, judging from my own experiments, there is to my mind no doubt that some forms of artificially-induced tuberculosis in animals acquire gradually characters which make them identical with the spontaneous tuberculosis in man or beast, yet I do not think it is at all proved that the lesions so rapidly arising from the effects of the inoculation with the bacillus of Koch are identical with tuberculosis in man. The proof, then, upon this point, the supreme one for the settlement of the question of the nature of tuberculosis, is yet to be furnished.

2. *There should be some evidence showing that inoculation in men is followed by the same result as follows the inoculation of the same material in animals, and that the disease is really contagious.*

[1] Virchow's Arch., lxxii., 1878, and ibid., xci., 1883.
[2] Vratsch, No. 6, 1882.
[3] Centralblatt, No. 19, 1882.
[4] To the same conclusion, I hope, will also come my esteemed friend Prof. Brose, if he repeats his experiments published in the *Medical Record*, January, 1884.
[5] Virchow's Archives, vol. lxxvi.
[6] Arch. f. Exper. Path., vol. i.
[7] Schottelius, loc. cit.

In favor of the direct inoculability of tuberculosis in man the following is presented:

At a recent meeting of the Académie de Médecine, M. Verneuil related the following history. In July, 1877, a house surgeon (*interne*) at the Ste. Eugénie Hospital, who performed all the post-mortem examinations, one day noticed a papule at the base of the nail of his third finger. The apex presented a white spot, and a few drops of pus escaped from it. It was frequently cauterized, but the phalanges became attacked, and a cold abscess spread over the back of the hand. After three years' treatment, having failed to produce any improvement, M. Verneuil amputated the finger. The house surgeon was believed to be cured, and practiced in the provinces. Quite recently he has been again attacked by cold abscesses in the lumbar region, causing intense pain; during violent attacks of pain the arms exhibit clonic convulsive movements. M. Verneuil has operated a second time. He is convinced that his patient became inoculated with tuberculosis when performing a necropsy. A similar misfortune happened to Laennec. One day, when operating on a tuberculous patient, he slightly cut himself with a saw. A swelling appeared on the wounded part. Laennec cauterized it with antimony chloride. The swelling disappeared, but twenty years subsequently he died from tuberculosis.[1]

We have seen that clinical evidence and statistics do not elucidate a contagion for tuberculosis, and that the few isolated instances of apparent contagion offered cannot stand the test of scientific scrutiny. An infectious or contagious disease can have only one cause, and cannot be at one time due to a contagion, and at other times arise from a variety of causes; hence the latter part of the proposition must be answered in the negative.

This being the case, the *parasitic* origin must also be denied it, as a necessary consequence.

As to the first part of the proposition, too little is known of scientific observation upon this point in regard to tuberculosis. According to the exhaustive investigation of Dr. Law,[2] there is no evidence that tuberculosis has ever been conveyed through vaccination.

I must mention, though, an actual inoculation-experiment upon man, not so much on account of its inherent value, as because it has been quoted with great reliance in support of the infectiousness of tuberculosis. Demet, Paraskeve, and Zallonis, in Syra, Greece,[3] "inoculated a man of 55 with tubercle. He was suffering from gangrene of the left great toe, due to the obliteration of the femoral artery, and his death was inevitable, as he had refused to submit to amputation. His lungs were carefully examined and found to be sound. They inoculated the upper portion of the right leg with sputa from a man who had abscesses in his lung. Three week later there were signs of commencing induration at the summit of the right lung. The patient died on the thirty-eighth

[1] Paris Correspondence of the *British Medical Journal*, quoted by Boston *Med. and Surg Journal*, No 10.
[2] National Board of Health Bulletin, No. 40, 1882.
[3] Quoted by *Med.-Chir. Review*, Oct., 1874, from *Gazette Médicale*, 1872, page 192.

day after the inoculation, from gangrene. At the necropsy there were found at the apex of the right lung seventeen small tubercles, varying in size from that of a mustard seed to that of a lentil. Two similar tubercles were found in the left apex, and two others in the liver. The experimenters concluded that the embryonic state of the tubercles and their linited number were due to the short time since the inoculation."

This isolated experiment, as well as any of the experiments on animals, is valid only when we take it for granted that the experimenters are able to differentiate spontaneous from artificially-induced tuberculosis. This is not probable in the case just quoted. We are told that the man experimented upon was suffering from an exhausting disease, and it is well known that at least one-third of the autopsies in such cases reveal tubercular disease.

Directly bearing upon the proposition under consideration are again those Würzburg feeding-experiments, in which material known to be infested by tubercle-bacilli was used, often raw, for years as food, under strictly scientific supervision, with absolutely negative results, and which tended to show that man does not react at all upon the tubercle-bacillus.

3. *There should be found a definite parasite at the beginning of the diseased process, and in sufficient quantity to account for the changes in all cases, and in all tissues involved by the disease.*

In relation to tuberculosis this proposition cannot be answered in the affirmative; and it is by no means as definitely settled as some high clinical authorities hold with Koch, that there is but one "specific parasite" in tuberculosis.

Klebs,[1] Toussaint, and Schüller[2] have observed *micrococci* to be constantly present in tuberculous lesions and products (and have induced artificially the disease with the isolated micrococci), and no one has *proved* anything to the contrary; while Koch and Baumgarten[3] discovered *bacilli* in the same lesions. Koch claims for his bacillus more than is consistent with the laws of physiological and pathological life and sound argumentation, and more than is in correspondence with the actual proofs offered in relation to the pathogenetic properties of this bacillus.

The reports of some competent microscopists and pathologists (when the originals are examined) show that the tubercle-bacillus is not invariably present in all cases and all products of tuberculosis; and, if present, it is often not seen in sufficient quantity to ascribe to it the claimed significance; and, furthermore, it is, as a rule, not present in the beginning of the disease. On grounds of personal investigation I can offer similar testimony.

The bacilli should be present in every lesion and in all cases, and in the beginning of tubercular disease, and not chiefly in its degenerated products, if tuberculosis is to be called a parasitic disease, in accordance with the laws of pathology. In all well-established parasitic diseases the parasite is a necessary factor, and is invariably present, unless there should be established for the "tubercle parasite" an exceptional, new, and mysterious mode of action.

The truth of the matter appears to be, and, indeed, from my daily observations in the laboratory upon a large quantity of material, I regard it as a fact, that the tubercle-bacillus of Koch is a mere concomitant of cheesy disintegrated materials, even if it be preëminently of tuberculous cheesy materials.

4. *Given a parasite that is the cause of a disease, it should, when isolated and inoculated into an animal liable to that disease, always reproduce that disease; but its action should be specific,—i. e., it (the parasite) alone should be the causative factor.*

There is no doubt that Koch's tubercle-bacillus, when isolated and cultivated for many generations and then inoculated into certain animals, is capable of inducing tuberculosis, or a nodular eruption not distinguishable from it, more readily than other irritants, so far as tried. Success in inoculating is particularly frequent in rabbits and guinea-pigs (although not so common as Koch claims), but only conditional and rare in other animals.

Thus it appears that the above proposition could be answered for tuberculosis and the bacillus in the affirmative if only the following points were proved:

1st. That the nodular lesion thus induced is really tuberculosis, identical with the human disease.

2d. That this bacillus is the only bacterium or the only irritant capable of inducing tuberculosis; and,

3. That its action is specific,—*i. e.*, that the bacillus is the only agency or factor at work, the sole cause of the disease.

The first point is not proved, as probable as it may appear. The other points are open to the following considerations and objections:

It has been proved that in tuberculosis micrococci, as well as bacilli, are causal, the evidence being "strong" for either "parasite;" whereas the bacillus alone should be the causal factor. As long as not *disproved*, Kleb's, Toussaint's, and Schüller's investigations (in relation to the micrococci as causal factors) have as much claim as Koch's. The method of cultivating those tubercle-micrococci, as practised by those investigators, was one not favorable for the development of the tubercle-bacilli. Further, Watson Cheyne's assertion that bacilli *must have been* present in the cultured materials with which those investigators inoculated successfully, is altogether a gratuitous assumption, and his few and imperfect control experiments with Toussaint's micrococci were not satisfactory, and, in fact, neither prove nor disprove anything.[1] Koch did not try the effects of any other fungus than that of his bacillus in relation to tuberculosis.

Koch further claims that the specific character of his bacillus is supported by the rapidity of its effects, and brings forward the inhalation experiments of Tappeiner and the experiments upon the eye. The former I have shown to be valueless, as those nodules

[1] Klebs now admits the bacilli, but denies that they are invariably present, and denies on grounds of experiments their exclusive pathogenetic properties, although he admits that they are a not unimportant admixture to his micrococci.

[2] Loc. cit.

[3] Loc. cit.

[1] See Watson Cheyne's report, *Practitioner*, April, 1883, pp. 272–276.

produced in the lung, especially if rapidly formed, are not tubercles. I have also reason to believe that the same is the case with many of the experiments on the eye, especially in those cases in which an apparently acute miliary tuberculosis of the lung rapidly followed the inoculation; in fact, in some instances this eruption occurred in a much shorter time than is at all possible for tubercles to develop.

Koch has not proved that his bacillus is the only agency at work in the production of tuberculosis. Although he undoubtedly inoculated the pure bacillus, he ignored the specific reaction of the soil; and it is the latter which I hold plays the most important *role* in determining the formation of tubercle. In introducing the bacillus into the animal organism, another factor—the injury inflicted, and its effects upon the living cells of the body—must be taken into consideration.

In some animals all the tissues of the body react equally upon the introduction of irritants; in others only some one of the tissues responds, such as the serous membranes. This surely demonstrates the specific action of the soil.

I must again call attention to the fact that in making his experiments, Koch injected the bacilli into any part indiscriminately in scrofulous animals, while in non-scrofulous animals (dogs, rats, cats) he injected them only into the peritonæum or the anterior chamber of the eye, where, we know from experience and from repeated experiments, any irritant of sufficient intensity may create tuberculosis.

This cannot be explained by the assumption of Koch that the bacillus must merely be enclosed in something, so as not to be eliminated, before it can exert its effect.

To me it appears that the reason why we must inoculate in serous cavities to produce tuberculosis in the dog or cat, is, because we want not so much the specific action of the irritant (say of the bacilli) as the properties of the serous membrane. It is now well known that any chronic inflammation of serous membranes may lead to primary tuberculosis. It is proved that we do have a primary tubercular synovitis or a primary tuberculous pericarditis; and that bacilli could be instrumental in its production is highly improbable.

In surface tuberculosis like that of the lung, the bacilli, in my opinion, also play only a secondary *role.*

Koch himself admits that it is not likely that the bacillus when inhaled by man could get a foothold in a normal lung. He says distinctly in his original articles that the lung must be predisposed for the reception and the action of the bacilli. Under such predisposition he understands and enumerates the following lesions: "*desquamation of the epithelial lining of the respirartory tract, stagnating exudates and secretion in the lung, adhesions, anomalies of respiration,*" etc. Now, here is a matter of mere interpretation of these lesions. Koch innocently calls them "predispositions," while every pathologist will designate some of these lesions as suggesting already-existing pulmonary phthisis. In fact, at the present standing of our knowledge of pulmonary phthisis we can have no desquamation of the vesicular epithelium without preceding tubercular infiltration.

Watson Cheyne is also considerate enough to say,[1] "* * * it seems to me that the lung must in addition be prepared for the reception of the bacillus, as may be the case if congestion or slight inflammation be present at the time of the inhalation of the organism."

That in inoculations into serous cavities the latter do not act merely in preventing the bacillus from escaping or being eliminated, and that the stagnating secretions in the lung do not act merely as a glue to retain the bacillus in order to allow the accomplishment of its effects, is, to my mind, proved by the following experiments of Bollinger. Bollinger,[2] in order to show that tuberculosis could not be transplanted by vaccination, made superficial *cutaneous* inoculation in rabbits with tuberculous materials with negative, and deep *subcutaneous* inoculations with the same material, followed by intense inflammation, with positive results. In both cases the wounds were covered by a layer of collodion to prevent the "elimination" of the bacillus.

Thus it appears that the bacilli by themselves have no effect upon the healthy organism or the normal tissues. A predisposed soil is the chief factor and is pre-eminently necessary for the production of tuberculosis; while, on the other hand, it is not proved at all that the bacillus is invariably necessary for the production of tuberculous lesions. Although the tubercle-bacillus is more liable to excite tuberculosis in an already inflamed and ill-nourished soil than all other simple irritants so far tested, it (the bacillus) might be readily substituted by other irritants.

The matter must unquestionably be tested further, but from the above evidence it is clear that a general fear of the bacillus tuberculosis as a contagion is unjustificable, and that the ordinary dust suspended in the air is to certain persons as dangerous as the bacillus.

5. *The specific lesions of a disease resulting from the inoculation of a specific parasite must also contain that parasite, and have the specific properties of reproducing the same disease when re-inocnlated in other animals.*

Koch claims that the products obtained in animals by inoculation with bacilli are capable of producing tuberculosis when inoculated into a second animal, while the products obtained by inoculation with innocuous substances do not have this effect. The former proposition is true, but the latter, I hold, is not in accordance with facts. In my own experiments, to be detailed in my forthcoming report, tubercles produced by inoculation with innocuous material under antiseptic precautions were likewise capable of producing tubercles when inoculated into other animals, having thus the same action as the innocuous material primarily used.

I have also shown above (see bacillus chapter) that in secondary tuberculous products bacilli may be absent.

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[1] Loc. cit., p. 314.

[2] Zur Ætiologie der Tuberculose, *Prager Med. Wochenschrift*, Nos. 4 and 5, 1884.

The experiments of Martin,[1] which tend to show even the progressive virulence of products obtained from re-inoculation with tuberculous material in a series of animals, have been substantiated by no one.

Martin's assertion, also, that inoculations with products obtained by the introduction of innocuous substances never produce true tuberculosis, and that after a series of re-inoculations these products lose their power of acting even as local irritants, is, according to control experiments, positively wrong. On the other hand, views have been expressed, based upon experiments (I think also by Martin), that products obtained by inoculation with non-tuberculous substances, when re-inoculated may gradually become specific, and increase in virulence in producing tuberculosis.

6. *Finally, a given parasite and no other substance should, the conditions remaining the same, be capable of producing a parasitic disease.*

In my previous studies, judging from the literature alone, I was fully impressed with the idea that tuberculosis had a specific exciting cause, and that it could be induced by inoculation with tuberculous materials. Moreover, having made numerous inoculations with tuberculous matters, I convinced myself of this fact. Hence I accepted the view that tuberculosis is inoculable in certain animals.

But at the same time, after repeating under various modifications the well known control experiments, I found that, beyond doubt, even true tuberculosis could be induced by substances other than tubercular, and that failures to induce tuberculosis with tuberculous materials were in certain animals nearly as common as successful inoculations with innocuous substances.

To these experiments I will return in my forthcoming report.

It will be also necessary to first consider the evidence of those observers who, from the results of their own exhaustive experiments, negatived the exclusive or specific infectious properties of tuberculous materials. This negative evidence is by far more voluminous and strong than the admirers of the hypothesis of the contagiousness of tuberculosis suppose; excited admirers having especially arisen since the ingenious article of Koch appeared.

It is, however, remarkable that some of the writers on tuberculosis fail to understand that the pivot of the question of the ætiology of tuberculosis does not rest upon the fact alone whether or not the bacillus induces lesions analagous to tuberculosis, but preëminently upon the fact whether innocuous substances have or have not the same effects.

Thus, above all, the negative evidence must be carefully inquired into, not by relying upon the crippled and sometimes misrepresenting and meager quotations of some of the compiling writers, but by submitting the original communications of the authors and experimenters to a careful perusal.

Together with the accounts of the much-quoted experiments of investigators who succeeded in inducing tuberculosis in animals with tuberculous substances only, the reading and thorough examination of the records and results of experiments of the observers to be mentioned below are unavoidably necessary.

[1] *Journal d' Anatomie et de Physiologie*, April, 1881.

The following observers all refer to many or few experiments of their own, in which tuberculosis resulted from the inoculation with either innocuous substances or with specific matters other than tuberculous:

Lebert, *Allgem. Med. Central-Zeitung*, 1866.
Lebert and Wyss, *Virchow's Archiv*, vol. xl, 1867.
Empis, Report of the Paris Internat. Med Congress, 1867.
Burdon Sanderson, *British Med. Journal*, 1868.
Wilson Fox, *British Med. Journal*, 1868.
Langhans, *Habilitationschrift*, Marburg, 1867.
Clark, *The Medical Times*, 1867.
Waldenburg, Die Tuberculose, etc., Berlin, 1869.
Papillon, Nicol, and Leveran, *Gaz. des Hop.*, 1871.
Bernhardt, *Deutsch. Arch. f. Klin. Med.*, 1869.
Gerlach, *Virchow's Archiv*, vol. li, 1870.
Foulis, Glasgow *Med. Journal*, 1875.
Perls, *Allgemeine Pathologie*, 1877.
Grohe, *Berliner Klin. Wochenschr*, No. 1, 1870.
Cohnheim and Fränkel, *Virchow's Archiv*, vol. xlv, 1869.
Knauff, *41te Versamml. Deutsch. Naturforscher*, Frankfort.
Ins. Arch f. Experim. Pathologie, vol. v, 1876.
Wolff, *Virchow's Archiv*, vol. lxvii, 1867.
Ruppert, *Virchow's Archiv*, vol. lxxii, 1878.
Schottelius, *Virchow's Archiv*, vol. lxxiii, 1878; *ibid.*, xci, 1883.
Virchow, *Virchow's Archiv*, vol. lxxxii, 1880.
Stricker, Vorlesungen über Exp. Pathologie, Wien., 1879.
Martin, *Med. Centralblatt*, 1880, No. 42.
Wood and Formad, *National Board of Health Bulletin*, Supplement No. 7, 1880.
Robinson, Philadelphia *Med. Times*, 1881.
Weichselbaum, *Med. Centralblatt*, No. 19, 1882, and *Med. Jahrbücher*, 1883.
Balough, *Wiener Mediz. Blätter*, No. 49, 1882.
Wargunin, *Allg. Med. Centralblatt*, April 8, 1882.
Hänsell,[1] *Arch. f. Ophthalmologie*, vol. xxv.

Some of the observers enumerated did not consider the miliary eruptions obtained experimentally as true tubercles, but the majority did so, and, as I will show later, presented excellent and reliable experiments and sound reasoning in support of their views.

Shall all the above evidence go for naught merely because Koch has discovered a bacillus which is capable of inducing in animals lesions resembling tuberculosis?

I trust it will not. Koch has, so far, no authority to claim *exclusive* pathogenetic properties for his bacillus, as he made himself no satisfactory control experiments with substances other than tuberculous. The few control experiments he offers, viz.: that *sterilized* blood-serum (!), tuberculous material soaked in alcohol, and fresh scrofulous glands, or pus from

[1] Hänsell, who inoculated animals with gummous growths and syphilitic pus, obtained an exquisite miliary tuberculosis from the effect of these substances. In this connection may also be mentioned the following:

Damsch (*Centralbl. f Med. Wissen.*, July 21, 1883), who obtained tubercular eruptions and nodes in the brain in rabbits through inoculation into the eye with the cultivated bacilli of leprosy. Similar inculation with leprous material led to a perfect miliary tuberculosis in rabbits id the hands of Kaposi, of Vienna, (*Wiener Med Presse*, Jan. 21, 1883)

Pfeiffe., Dontrelpont, Cornil and Babés, loc. cit., had the same experience with lupous material

Bodamer (Inaugural Thesis, Univ. of Penn., 1884,) had, as the result of inoculating with the pure cultivated actinomyces fungus, a striking general miliary tuberculosis in rabbits.

Inoculation with materials from glanders gives also rise to tubercles in the lungs, etc, not distinguishable under the microscope from the true miliary tuberculosis. But Löffler, who kindly demonstrated to me this fact in Koch's laboratory, and who also gave me a specimen demonstrating it, explained that the nodules in the lungs were not tubercle, because the bacilli found therein behave differently in staining.

tuberculous lesions, did not induce tuberculosis, prove little or nothing in favor of his bacillus.

Watson Cheyne, in his excellent report, displayed great care, diligence, and skill in his experiments and observations intended to corroborate Koch, but in making his control experiments he likewise was not very particular. So, in relation to inoculations with non-tuberculous substances he came to the conclusion that "not one of the twenty animals (inoculated with innocuous substances) became tuberculous"! But when the detailed account of Watson Cheyne's experiments is read over, it is amusing to learn that only nine out of the twenty-five supposed negative experiments were really known to be negative, because eleven of the rabbits experimented upon had been stolen before Cheyne had a chance to examine them, two rabbits died within a few days, or long before tubercle could develop, and in three rabbits the experimenter really records lesions that might have been tuberculous, in spite of the absence of bacilli in them, which latter circumstance, however, induced him to call the result a negative one.

These are instances of the way in which experimenters with preconceived and peculiar ideas upon a subject may unconsciously be misled in forming conclnsions from their own experiments.

Further, it is interesting to note that in the "classical" experiments of Solomon,[1] Baumgarten,[2] Tappeiner,[3] etc., among other substances, the following materials were used extensively for control: "Caseous glands from scrofulous child;" "caseous material from various sources;" "muscle, testicle, and kidney from tuberculous guinea-pig;" "cheesy pus from man and animals, cheesy infarcts, caseous tumors," etc. All these substances, which are known usually to contain the bacillus, were inoculated while fresh into animals, and are recorded by the experimenters above stated as having failed to produce tuberculosis. This is surely not consistent with the doctrine of Koch.

Wherever inoculation with innocuous substances was followed by positive results, the over-zealous germ-theorists call it "*accidental tuberculosis.*" They say that at the time of former experiments the communicability of tubercle by a mediate contagion was not recognized, and as the precautions necessary for thorough disinfection of instruments, surroundings, etc., were probably not observed, the channels for the introduction of the *bacillus* were, in all previous experiments, left unguarded: hence, they argue, *it must have been* this ubiquitous bacillus which induced the tubercle.[4]

Further admitting, however, that innocuous substances may induce tubercle-like bodies, they claim that these bodies are not infectious, *i. e.*, they are *false* tubercles.

All these objections would be very plausible if they were based upon actual observations and facts; but, unfortunately for the bacillus theory, they are not; they are *mere unfounded assumptions.*

The fact established by experiments, that a true tuberculosis can be induced in animals by inoculation with innocuous and various other substances, and the significance of this fact, can surely not be overthrown by the imperfect evidence that the bacillus is more liable to do so, and still less by the mere unauthorized opinions of some of the writers.

Erroneous conclusions and views may easily be formed through the misconception of the significance of experiments.

At the meeting of the Pathological Society of London (Dec. 4, 1883, quoted from the *Lancet*, Dec. 8, 1883), Dr. Wilson Fox announced the following: "He was unwilling that his former observations[1] should still be quoted as opposed to the doctrines of Koch and those who had been more recently working at the subject; and therefore he had felt bound to come forward and make known the modification which his views had undergone. At the same time," Dr. Fox, however, added, "there was perhaps some danger of phthisiophobia or phthisiomania. During the past thirty years there had been many changes in the doctrine of phthisis, and hardly any doctrine has lasted more than five years."

But what had happened to induce Dr. Fox to lose faith in his own honest and excellent former work? So far as I could learn, it was the following: Dr. Fox had requested a Dr. Dawson Williams to repeat his former experiments. This bacillus-excited gentleman introduced *carefully* some "*putrid fluids*" and some *setons* into a few guinea-pigs and—did not obtain tuberculosis! Now, they think, it was at once evident that in all the former successful inoculations with non-tuberculous materials the mischievous bacillus of Koch must have gained entrance.

The reasoning of the London gentlemen appears to have been here as follows: *Putrid matter and setons do not induce tuberculosis; but the bacillus does. Hence the bacillus is the sole specific cause!*

But what is gained or proved for the bacillus theory if any one given substance, when inoculated into an animal, does not induce tuberculosis? Does, through this, the necessity of contagion at once arise? Surely not. If, for instance, as I will prove, finely-powdered, sterilized glass is capable of induc-

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[1] Aftryk fra Nord. Med. Arkiv, vol. xi, 1879.

[2] Loc. cit.

[3] Loc. cit.

[4] In this connnection the following incident is interesting, particularly on account of the high authority of the observer:

Some experiments were made under the supervision of Virchow (*Berlin. Klin. Woch.*, 1880), principally with the view of testing whether the milk of animals affected with "pearl-disease" or bovine tuberculosis could reproduce the disease when fed to other animals. Virchow's own objection to experiments of this kind is that the various chronic inflammatory processes which occur spontaneously in animals are not sufficiently well known even to veterinary specialists. Further, in pigs, which he used in considerable numbers, scrofulous glands occur so frequently, from their alliance to man through their omnivorous habits, and their detection during life is a matter of such great difficulty, that results founded upon their presence must be accepted with great caution. The possibility of coincidence was also well illustrated by two cases in which several animals were found to be tuberculous after having taken the milk for some time from a cow which was diagnosticated during life as affected with bovine tuberculosis, but whose lungs were found at the autopsy filled with echinococcus cysts, and with no trace of tuberculosis.

The milk of another animal, which subsequently was found to be profusely affected by bovine tuberculosis, had, on the other hand, no effect when given as food to a number of healthy animals.

The only result that Virchow thinks is perhaps justified from these experiments is that more animals were found to be tuberculous among a certain number which had been fed upon the "pearly" milk, than among the same number which had been fed upon healthy milk.

(The above statements, first quoted by Dr. Whitney, of Boston, Professor Virchow corroborated in a conversation with me upon this subject last summer.—H. F.)

[1] Loc. cit.

ing a true tuberculosis, then it does not matter if putrid matter or setons failed to do it.

Cohnheim's acceptance of a theory of a specific poison for tuberculosis, which formed as its direct outgrowth, the basis of the bacillus theory, was also not justified from Cohnheim's own experiments. If he once succeeded[1] with innocuous substances in producing *peritoneal* tuberculosis, it is of no consequence that he subsequently[2] failed to induce an *iris tuberculosis*.

Negative results prove nothing under the above circumstances and in the presence of positive results. Most of the observations made in bacillus studies prove really nothing for the ætiology of tuberculosis, and some interpretations of the results of experiments in this direction are quite deficient, and not consistent with the principles of experimental pathology. Furthermore, some of the positive evidence must be excluded on account of the evident deficient knowledge of pathological anatomy on the part of some of the experimenters.

I am glad to be in the position to offer in my next communication a new series of observations and experiments on tuberculosis. These experiments, instituted under the auspices of Dr. Pepper, provost of the University of Pennsylvania, and executed by myself and assistants under all rules of scientific precautions and with full facilities for such work, plainly demonstrate that *the ætiology of tuberculosis does not rest with Koch's "parasitic" bacillus or any other "contagion."*

The experiments referred to will be given in full details in a special report now in progress and soon to be published with appropriate illustrations, etc.

I desire, however, to announce here that my experiments prove that finely powdered, sterilized glass, ultramarine blue, and other substances, are by themselves capable of producing tuberculosis in animals or tissues liable to this affection.

Further, I will offer proof that this effect (tuberculosis) ensues without the intercurrent action of any bacterium. And, finally, that in those instances where miliary, nodular eruptions have been induced by the tubercle-bacillus (or substances containing it), the action of the latter is a purely mechanical one, like that of simple irritants.

Further, these experiments show that the only advantage which the bacilli have over other finely divided matter and simple irritants is that the former multiply and thus intensify their action, while mechanical irritants have not this property, and hence must be introduced in larger quantities. The more finely divided the matter, the more prompt seems to be its effect, and I believe it is impossible to render any matter more finely divided than the bacilli.

Like others, I also often succeed in tracing the formation of the tubercle-nodules to the effects of the irritating particulate matter, if the latter were or could be made distinct enough to be seen within the nodes. When ultramarine blue was used for inoculation, granules of the latter substance were seen within the nodes when bacilli were used to that end, then bacilli could be detected within the nodes; but in either case these primary nodular eruptions, *if rapidly formed*, do not yet represent tuberculosis, as I will show.

It is generally conceived that a specific infectious disease, such as instanced by variola, syphilis, anthrax, etc., can have only one cause or one poison which will produce that disease and nothing else, and cannot be substituted by anything else.

For tuberculosis this is not true, for we have bacillary and non-bacillary forms of tuberculosis.

It is now no more a question of observation and experimentation, but rather one of interpretation and understanding of the results; for we have seen that the evidence from experiments and microscopical studies is nearly sufficient.

But there are misconceptions. If that only is tuberculosis where the bacillus of Koch is found, or that only which arises from the effects of this bacillus, then Koch's theory of the exclusive pathogenetic properties of the bacillus is correct, and under such a definition tuberculosis has only one cause. But if true tubercles exist and can be produced without the bacillus, which has been shown to be the fact, then Koch's theory cannot be accepted from a pathologico-anatomical standpoint; or else we are obliged to admit two or more kinds of tuberculosis,—one due to Koch's parasite, and others to a variety of causes.[1]

So far, however, we have no reason, from a pathologico-anatomical standpoint, to subdivide tuberculosis, and therefore I am of the opinion that Koch's view of the exclusive pathogenetic property of his tubercle-bacillus, is decidedly overdrawn, and even not warranted by facts. Neither the specific action of Koch's bacillus, nor the specific character of tubercle, nor the contagiousness of phthisis or of any form of tuberculosis, is proved.

Only after a complete harmony of the facts derived from pathologico-anatomical, experimental, and clinical studies in tuberculosis with those revealed by mycology, and not from either of these alone, can we arrive at a settlement of the question of the ætiology of tuberculosis.

Further details concerning this question will be incorporated in my report. This will embrace also studies into the onset, and distribution of tuberculous affections.

From the above analysis of the bacillus question, and of the ætiology of tuberculosis, the conclusions follow—

1. That the bacillus of Koch is a valuable diagnostic sign of tubercular disease.
2. That nothing is proved by its discovery for the ætiology of tuberculosis.
3. That the too ready acceptance of the bacillus doctrine is not justifiable, and is likely to do more harm than good.
4. That neither phthisis nor any form of tuberculosis is contagious.

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[1] Loc. cit.

[2] Sitzungsberichte d. Schlesischen Gesell., 1878.

[1] A suggestion to separate an "infective" form of phthisis from ordinary phthisis had been made by Dr. Reginald Thompson (London *Lancet*, No. 6, 1880, quoted by R. S. Smith, Bristol, *Medico-Chir. Journal*, No. 1, 1883). "In a series of 15,000 cases observed. 15 cases (only one per one thousand) proved to be of an infective kind,—viz.: with history of contagion and absence of phthisical family history."

A CLINICAL NOTE ON BRONCHO-PNEUMONIA, WITH SPECIAL REFERENCE TO SURFACE REFRIGERATION FOR CONTROLLING HIGH TEMPERATURE.

BY L. S. MCMURTRY, A.M., M.D., OF DANVILLE, KY.

No pathological process is of more vital interest than that of fever, and no question in therapeutics has of late years elicited more discussion than the application of cold water to the surface of the body for the reduction of high temperature. Whatever may be the mechanism of fever from a physiological stand-point, it is a well-established clinical fact that very high temperature long continued is a most potent factor in the fatality of acute diseases. Although wholly a consequence of the pathological processes going on in the system, it is of itself a powerful menace to life. While quinine, salicylate of soda, and digitalis have been employed for their antipyretic influence, we can assume that the most powerful agent in this respect is the cold bath. The attention which this subject of necessity claims in every department of medical practice will render the observations here recorded of interest, and, may be, of value.

On Friday, December 22, 1883, I was called to see F. S., aged five years, and encountered the following symptoms and condition: The patient is a very robust boy, of healthy parentage and large for his years. On the previous day he experienced a chill, followed by fever, soreness of the chest and cough. At the time of my first visit I was informed that he had suffered with a cold for several days, and had grown rapidly worse since the chill of the preceding afternoon. The temperature was 104° F[1], pulse 120, and the respirations numbered 42 per minute, being superficial and labored. The cough was bronchial and somewhat suppressed. The normal pulmonary resonance was appreciably impaired over the left lung, and coarse *râles* were audible over its entire surface. The condition of the alimentary canal suggested a cathartic, which was at once prescribed.

On the following morning the physical signs were conspicuous and characteristic of broncho-pneumonia, having extended over both lungs. With each respiration the alæ of the nose were dilated and all the extraordinary muscles of respiration brought into action. The pulse was 140 per minute, temperature 104.5°, and respiration 48 per minute. The cathartic had acted during the night, and the patient took a small quantity of milk. I prescribed ten grains of quinine with one-fourth of a grain of pulverized digitalis, to be given at once, and directed that the patient receive a warm sponge-bath every hour. I saw the patient six hours later, and no material change was found in his condition. He complained of pain in the belly, and suffered from dyspnœa. I prescribed tinct. ipecacuanha comp.; (liquid Dover's powder, squibb,) in doses of four drops every three or four hours as indicated.

[1] The thermometric obsevations in this case were made with a Hicks' thermometer, tested and corrected at the Kew laboratory at Richmond, Surrey.

On Sunday morning, the third day in my care and the fourth of the disease, the condition was thoroughly alarming. Pulse 160; temp. 105.8° F.; respiration 60. The patient had brief snatches of uneasy sleep during the night, with increasing restlessness, followed by a tendency to somnolence. There was no cyanosis, or other evidence of carbonic-acid poisoning. I recognized the danger of the excessive and prolonged body-heat, and determined to resort to active measures for its rapid reduction. A large bathing tub containing sufficient water to immerse the entire body, was placed beside the bed; and after placing a cold cloth upon the head, he was gently lifted into the tub. The temperature of the water was 98° F., and cold water was added until the temperature of the bath was reduced to 60° F. At the end of eight minutes the thermometer showed a reduction of the patient's temperature to 102.5° F., when he was removed and placed in bed. The good influences of this method of treatment were evident from the moment it was instituted. As soon as placed in bed the patient fell into a tranquil sleep. An hour later he took a small quantity of milk. At the end of three hours the temperature had ascended to 105.2° F., and the bath was repeated. This method was continued throughout the day and night, administering the bath every two or three hours, as soon as the thermometer indicated a temperature of 103.5° F. The thermometric observations were made every hour, and I remained almost constantly with the patient, giving personal attention to the technique of the treatment.

At noon on the following day (Monday) the baths were discontinued, the patient having received eleven cold baths in twenty-nine hours. At this time the temperature was 102.5°; pulse 138; respiration 48. The physical signs gave evidence of resolution, and the patient took milk in small quantities at intervals. No material change was noted during the afternoon of this day, and the following day (Tuesday), the temperature, pulse and respiration being, with slight variations, as just indicated, and we were anxiously, but confidently, awaiting the trustworthy evidences of convalescence.

On Wednesday morning brain symptoms appeared, and put aside for the time all our cherished expectations. Ideation was confused and illusions occurred. Patient complained of intense headache, the eyes were suffused, and coördinated muscular movements were performed with difficulty. At noon the temperature was 104.5°. The rubber-coil cap was applied to the head. At this time very cold weather was prevailing, and water reduced to the freezing point by exposure to the atmosphere after being drawn from the cistern, was applied. From a bucket elevated above the head of the bed, a continuous current was passed through the rubber coil. In the evening of this day the symptoms were those of depression, with somnolence. Five grains of calomel were administered at 6 P. M.

Thursday morning the symptoms had appreciably improved. Patient had two copious bilious stools during the night. The temperature came down to 102.2°, and the cold applications to the head were

discontinued. Ideation was clearer; patient had a severe paroxysm of coughing; takes milk at intervals. Respiration 34; pulse 112. Very little change was manifest in the symptoms during the remainder of this day. Patient slept at intervals, and took nourishment in small quantities.

Friday morning the improvement was marked. Temp. 99.5; pulse 102; respiration 28; mind clear; expression good. The physical signs were those of progressive resolution. He slept several hours during the forenoon of this day, and asked for food on awakening. From this day, just one week from date of my first visit, convalescence was established, and continued without further interruption.

In arranging these notes and recalling the phases of this severe illness, I cannot but feel how much the successful issue is due to the unremitting attentions of the intelligent parents of the patient. In the application of the heroic methods of treatment I received throughout their cordial aid and coöperation.

MEDICAL PROGRESS.

THERAPEUTICS.

ON THE USE OF IODINE AND OF THE ERGOTINE OF IRON IN GOITRE, AND PARTICULARLY ON ITS PARENCHYMATOUS INJECTION.—Dr. Bawvens has a long and interesting article on the subject in the *Bulletin de l'Académie Royal de Médicine de Belgique*, in which he gives the following useful indications for the treatment by these drugs:

INDICATIONS.

TINCTURE OF IODINE.	ERGOTINE.
(*a*) Cystic goitre, successful.	The same.
(*b*) Soft, diffused recent goitre, sometimes successful.	Success certain.
(*c*) Vascular goitre, dangerous and useless.	Success certain.
(*d*) Exophthalmic goitre, dangerous.	Its physiological action ensures success.
(*e*) Degenerated goitre, harmful.	It has been successful even in an ossified goitre.
(*f*) Fibrous goitre, useless.	It may succeed.
(*g*) Cancerous Goitre, useless.	Useless.

DANGERS.

(*a*) The inflammatory swelling is always intense; the symptoms of compression of the trachea, of the vessels, and of the nerves of the neck are very marked, so as to threaten a cerebral congestion and sometimes asphyxia. The pain, produced by the injection, is very severe.	The tumefaction is nothing when one considers the action of contracting, which is but little appreciable in the simple cystic goitre, but sometimes intense with a degenerated goitre. In the case of an abscess, by the use of the bistoury or trocar, all the symptoms of compression are made to disappear. The pain of the injection is almost nothing.
(*b*) Several cases of death have been recorded: Schwalbe, Sücke, Hicguet, etc.	It is not at all dangerous.

READINESS OF APPLICATION.

To have a sufficient effect, from 1 to 5 and 6 grammes should be injected at a time, which requires either a special instrument or the pain of five injections. In order that the canula and mountings of the syringe shall not be attacked by the iodine they must be gilded. To lessen the pain of the injection, it is often necessary to have recourse to ether in the atomizer. The result of the injections is often not appreciable until after two to five months of treatment, and the injections cannot be repeated at will.	Pravaz' syringe is all that is necessary, and the injections are given as required, leaving ordinarily an interval of three to four days between each.

RESULTS.

This has been successful in certain cases. Levéque has noted 32 out of 48, but on the other hand, there have been a great many failures. Lebrecht records 322 cases of thyrodectomy, in all of which iodine had failed.	In the eight cases in which it has been tried, each one has proved a success.

The preparation of ergotine (d'Iron) referred to is compared with that of Boujean as being double the strength of the latter, and instead of being syrupy and viscid, it is transparent, clear, and can be injected pure.

MEDICINE.

THE USE OF VERATRINE IN GENERAL OR LOCALIZED PRURITUS.—Dr. J. Cheron (*Jour. des maladies des femmes; Gaz. des Hopitaux*) treats the pruritus, which is so difficult to relieve, and which appears at the menopause, with an eruption of prurigo, urticaria, eczema, herpes, or without any such eruption, by the use of a pomade composed of:

Veratrine.....15 centigrammes.
Lard.....30 grammes,

of which he applies a piece the size of a small pea, morning and evening, a a soothing ointment, when the pruritus is localized in the groins, armpits, abdominal walls, etc.

But when the pruritus is more general, the internal use of veratrine is preferable, in the following doses:

Veratrine.....2 centigrammes.
Pulv..... .....glycyrrhizæ, 9 s.

Divide into 40 pills. Take 2 to 6 pills a day, one-half hour before eating, or three hours afterwards, never taking but one pill at a time, and increasing by one each day, until the maximum dose (3 milligrammes) is reached.

A CASE OF SUDDEN SPASMODIC ICTERUS.—M. Potain (*Gaz. des Hopitaux*) refers to several stories related in reference to the sudden appearance of icterus, as in the case of the two duellists, where on crossing their swords, one became suddenly so yellow that his

adversary dropped his sword in amazement, the case of a patient of Bouillaud, who, feeling very well, got up in the morning and proceeded to shave himself, when a letter was handed to him containing very bad news, and when he turned to finish his shaving, he found himself turned yellow; and the case of the woman whose husband was taken by the Commune, and about to be shot before her eyes, she turned yellow at the moment of taking aim by the detail of soldiers.

He then relates the case of a very nervous and irascible woman, in good health, who the day before her entrance into the hospital, about 10 A. M., became violently angry. Some hours later she was surprised to learn from her neighbors that she was jaundiced, and came to the hospital to be treated for the affection, which was readily relieved. The only admissible explanation of this phenomenon seems to be the influence of the abdominal sympathetic system, in its relations with the emotional centers, resulting in a sudden dilatation of the vessels of the liver, the equilibrium is disturbed and a partial vacuum created, which causes the biliary fluid to transude from the hepatic cells into the blood-vessels; whereas, in the normal state, the contrary is the case.

ON THE NEURALGIAS OF DIABETES.—Dr. Comillon (*Revue de Medicine*) gives us an extended article on this subject. In the literature of the subject he finds Griesinger in 1859, indicating the frequency of sciatica in glycosuria, who was followed by Braun in 1868, and a number of others in succession; but Worms, in 1881, was the first to establish the close relation between neuralgia and glycosuria, and to give a certain physiognomy to the three characters of the acuteness, the tenacity and the symmetry of the neuralgia. In recording his observations, he established the following four propositions:

1. There exists a special form of neuralgia peculiar to diabetes, which presents the character of being located symmetrically in the same nerve branches.

2. Up to the present time, this symmetric neuralgia has been observed in the inferior dental nerves, and in the sciatic nerves.

3. The neuralgia of diabetes is more painful than that of all others.

4. It does not yield to the ordinary treatment of neuralgia, (quinine, morphia, the bromides,) but is aggravated and extended in accordance with the degree of glycosuria.

In support of these views of Worms, Dr. Comillon quotes Drasche, and others who reach the same conclusions, and he has gathered from these sources and from his own practice twenty-two cases of diabetic neuralgia upon which to base his conclusions, as follows:

Symptoms—The neuralgia is not generally an initial symptom, but occurs only after there is a notable degree of weakness, emaciation and polydipsia. Its onset is sudden and unexpected, occurring on awakening in the morning, as a continuous, piercing, lancinating or fulminating pain, and giving at intervals paroxysms which surpass in intensity and duration the most violent forms of neuralgia. These paroxysms occur three or four times a day, a slight movement or emotion being sufficient to produce them. However severe they may be in the daytime, they are worse at night. The pain is not always confined to the course of the nerves; it extends sometimes to the muscles and to the bone. Digital pressure along the course of the nerve exaggerates the pain; more extended and firm pressure quiets it. Movements increase it, and it is the same with rapid changes of temperature. With the most severe attacks there is no fever, the skin is cool, and the pulse normal. One of the most prominent and constant symptoms is the symmetry of the neuralgia, this occurs rarely at the onset, most frequently one member is attacked at first, to be followed in a few days by its fellow; with the latter the same nerve branches are affected, and if in the first the pains do not pass a certain zone, not occupying the whole extent of the nerve, they preserve the same course in the second. Exceptionally the pain is equaly in intensity on both sides, but most frequently it predominates in one or the other.

In one of Drasche's cases, the affection took on almost from the first a bi-hemiplegic ? character. At first it was located in the right hip, extending in a few days to the arm, forearm and fingers of the same side, and finally the inferior and superior extremities of the left side became involved. The relations of the degree of glycosuria is not definite; in most cases, it is only when the glycosuria is very abundant that the pain is present, but in some cases the neuralgia has appeared when the glycosuria is at its minimum.

Progress and Prognosis.—In the most favorable cases the neuralgia after resisting the use of morphia, yielded to progressive doses of salicylate of soda—in other cases the ordinary anti-diabetic treatment (diet, alkaline mineral waters) caused a prompt cessation of the pain. Relief was coincident with a diminution of the sugar, but when the patient committed some irregularity of diet, or from other exciting causes, the neuralgia returned. When the diabetic character of the neuralgia is recognized early the prognosis is not grave. By submitting the patient to a rigorous diet it yields after a time. But if it remains unrecognized for a long time, there follow alterations of the muscular tissue, and atrophy, and paralysis of sensibility of the skin; lesions which are difficult to relieve.

Diagnosis.—All neuralgias occurring in the course of diabetes are not necessarily of a glycogenic origin. But when a diabetic complains of a sharp, fixed pain along the course of a nerve it is pretty sure to be of this nature. What has already been said of its character would, of course go far to establish the diagnosis.

Pathogenesis.—In considering this, Dr. Comillon, after reviewing the ideas of others on the subject, calls attention to the fact that diabetes has been looked upon as a manifestation of the uric acid diathesis, and he is convinced that glycosuria affects specially those persons who have had serious attacks of rheumatism or gout, bringing forward a number of considerations to sustain him in this opinion, therefore he gives uricæmia a prominent place of at least as much importance as hyperglycæmia in the pro-

duction of the neuralgia of diabetes. The last question which he considers is as to the peripheric or medullary lesion which causes this condition. The absence of hyperæmia, of vesicular eruptions, pemphigus and of paralysis would seem to exclude the idea of a neuritis. On the other hand so tenacious a neuralgia, affecting homologous nerves, and without known external causes, would seem to indicate a transitory lesion, unconnected with the anatomical elements of the medullary centers. All the symptoms point to a transitory lesion, whether this be located in the meninges, the gray or white substance is but a matter of speculrtion as no autopsy has yet been made.

A Case of Syphilis Cured by Means of an Intercurrent Typhoid Fever.—M. Defize, in the *Archives Médicales Belges*, relates the curious history of a patient, who in June, 1882, was affected by multiple chancres, which were soon followed by the symptoms of confirmed syphilis; pronounced adenitis in the groin and neck; general syphilitic papules, particularly one on the face; alopecia, marked emaciation, etc. Very little mercury had been given, and the specific treatment had been very incomplete. This was the condition of things when, in January, 1883, he was taken down with the ataxo-dynamic form of typhoid fever; all the symptoms were present with the exception of the lenticular spots, which were masked by the syphilitic eruption. The treatment was limited to cold water baths, tonics and diet. The duration of the fever was a month and a half. Once relieved of the typhoid fever, there remained no traces of the syphilitic affection. He had a good appetite, increased in flesh and strength. The writer refers to two other cases treated by his colleagues, which resulted as happily. He quotes Kaposi as recognizing in syphilitic cases a suspension, but not cure, of the syphilis, during the presence of the exanthematous fevers; here he claims a cure.

OBSTETRICS AND GYNÆCOLOGY.

On the Condition of the Gums in Pregnant Women.—M. Pinard treated of this subject in 1877, and now Dr. Henry Didsbury has made it the subject of his insurgural thesis, which is discussed in the *Revue Medico-Chirurgicale des Maladies des Femmes*. This disturbance of the gums consists of a swelling and softening, beginning about the second month of pregnancy. Dr. Didsbury describes three grades of the affection; in the third stage the inflammation is so marked as to give a violet red color to the gums they are puffed out, and the interdentary spaces stand out in marked relief. The tartar and the epithelial debris collects about the necks of the teeth, and the inflammation may extend to the alveolar periosteum, when the teeth become denuded and finally come out, being themselves in a perfectly healthy condition.

This gingiritis is located especially on the anterior portion of the maxillaries; it is rare to see it go beyond the canines, and the convex surface of the maxillaries is the only part affected. The other symptoms which present themselves are pain and local hæmorrhages.

The ætiology of this curious affection must remain as hypothetical. The treatment should be energetic. The tartar must be removed, and the condition met by astringents, chlorate of potash, etc.. and in severe cases by the tincture of iodine, chromic and a mixture of hydrate of chloral, and astringents.

On the Relations of Hepatic Colic to Pregnancy and Labor.—Dr. Cyr has devoted some attention to this subject, his remarks upon which are considered at length in the *Rev. Med. Chir. des Maladies des Femmes*. He reports 51 observations. In 11 of these the first attack took place during pregnancy, in 4 cases it followed a miscarriage, and in 36 it occurred after labor. It seems to be associated with certain factors, as: suppressed lactation, a defect or diminution of activity. a want of proper regime, and hereditary antecedents.

The last factor, that heredity was found to influence 4 cases as an hepatic heredity, 1 case as an arthritic, and in 5 cases there were previous or concurrent arthritic symptoms. In fact, pregnancy alone was the cause of the great mass of cases. How shall this action of pregnancy be explained? In a general way it is admitted that biliary calculi have a particular tendency to be formed, from some modification in the composition of the bile, either from the sluggishness of its circulation, or from some obstacle to its passage through the biliary ducts.

Pregnancy exerts an influence upon the liver which results at times in a more or less marked fatty degeneration, but it is not satisfactorily proven that this condition is favorable to the formation of calculi.

The direct or indirect compression of the liver during the last months of pregnancy is incontestable, and as a consequence a slowing of the circulation of the bile would ensue, with a tendency to the separation of the elements in that fluid, and the precipitation of cholesterine. This question of the connection between pregnancy and hepatic colic is interesting from a diagnostic point of view, that one may be prepared for its occurrence during pregnancy and soon after confinement, so as not to be misled by an erroneous interpretation of the symptoms, with its consequences.

The prognosis in pregnancy, except in cases of jaundice, is not affected by the presence of hepatic colic. The physician should insist upon certain hygienic precautions, such as relate to exercise, to alimentation, and to other means, the prophylactic value of which are recognized.

SURGERY.

An Instrument for Temporarily Closing Either Ureter.—Silvermann (*Berlin Klin. Wochenschr.*) figures and describes a new instrument by which either ureter can be closed long enough to al-

low of unmixed urine from either kidney to be collected for examination.

The instrument consists of a metallic double catheter, with quick curve, and a window 3½ cm.x 5 mm., near its point. The window can be closed by a shutter moved by a stilet. Within the catheter there is contained a firm elastic catheter, which terminates in a small expansible gutta percha balloon or tampon. When collapsed, this tampon is contained within the point of the catheter.

The instrument is passed into the bladder till its beak impinges upon the posterior wall in the middle line, guided by a finger in the vagina or rectum (in men). The window is then opened, and the tampon made to expand by pouring mercury into it through the elastic catheter. By the introduction of 20 c,cm. of mercury, which weigh about 270 grms., the tampon can be filled up to the size of a goose's egg, and, guided by the finger to either side of the middle line, will by its weight effectually prevent any outflow of urine from the ureter upon that side. The bladder can be emptied and washed out through the other channel of the metallic canula, and urine from the free ureter allowed to collect for from fifteen to twenty minutes, in which time quite enough for satisfactory examination can be obtained.

Silvermann had used it twenty-two times in women, and five times in men, and did not find its use attended with discomfort to the patient or followed by any evil effects.—*Centralbt F. Chir., Glasgow Med. Jour.*

OTOLOGY.

TREATMENT OF CONSTRICTIONS OF THE EUSTACHIAN TUBE BY ELECTROLYSIS.—M. Mercié has presented to the Paris Académie de Médecine a report on the experiments of Dr. Garrigue Dézarennes in the employment of this mode of treatment. He introduces into the rubber sound, while in position, a bougie composed of a bundle of very fine silver threads, which are curved upon themselves at the extremity, so as not to wound the walls of the tube. When the metallic thread reaches the back of the sound, it marks a point on the external portion, which indicates the degree of penetration, so that the exact location of the constriction is thus determined.

The sound being kept in place and the thread passed in, the moment it passes with difficulty it is forced no further, and in the external auditory canal a small silver olive-shaped conductor is passed to the immediate neighborhood of the tympanum. By connecting the shaft of the olive-shaped conductor with the positive pole, and the metallic thread which had entered the sound with the negative pole, a weak current (two or three elements of Chardin) is allowed to pass. The operation does not take more than a couple of minutes, and after its use the bougie, which had been tightly squeezed by the walls of the sound, passes readily. These results promise in electrolysis a great benefit, in cases of constriction of the Eustachian tube.—*Gaz. des Hopitaux.*

OPHTHALMOLOGY.

ON THE USES AND DOSE OF CYANURET OF GOLD AND OF POTASSIUM IN THE TREATMENT OF ATAXIC PAPILLARY ATROPHY.—M. Galezowski having reported (*Gazette des Hopitaux*) a case of atrophy of the optic papillæ which was consecutive to a locomoter ataxia of syphilitic origin, in which the ataxic affection was checked and vision greatly relieved by the use of the cyanuret of gold and potassium in hypodermic injections, the *Gazette* gives the formula and doses:

M. Galezowski employs the cyanuret of gold and potassium in hypodermic injections in doses of 5 milligrammes to commence with, then 10 milligrammes, every day or every other day. His evolution is as follows: Cyanuret of gold and of potassium, 20 centigrammes; aqua dist. 10 grammes. A fresh solution is more active and less irritating than preparations made in advance, and used sometime after. The injections should be inserted by preference in the back, along the spine, and at considerable distances from each other. They should penetrate deeply into the cellular tissue. Simply inserted in the thickness of the skin, they produce eschars, abscess, and phlegmonous inflammation of the skin. These accidents are easily prevented by taking the proper precautions.

NEW INVENTIONS.

NEW SURFACE THERMOMETERS.—M. Constantin Paul (*La France Medical*) has furnished three models of thermometers to take the local superficial temperature; one is vertical, one is circular, and one is horizontal. For their proper application two things are requisite; adhesion to the skin, and isolation from the surrounding atmosphere. This is accomplished by means of rubber arranged like a cupping glass. They can be applied anywhere to the surface where there is no hair, the air is exhausted from the rubber cup, it adheres to the skin, to which the thermometer bulb is brought in contact, and it is left at will, so that when removed the maximum remains as a permanent register, as in other clinical thermometers. The vertical, horizontal and circular positions given to the tubes are simply for ease of application in different situations.

AMONGST those upon whom the University of Aberdeen has just conferred the degree of LL.D., are Archibald Forbes, the famous and intrepid war-correspondent; Dr. George King, Professor of Botany, and Director of the Botanic Gardens, Calcutta; and Professor Lapworth, of Mason's College, Birmingham.—*British Med. Jour.*

DELEGATES FROM THE DISTRICT COLUMBIA.—Of the list of delegates to represent the Medical Association of the District of Columbia, as published in our last issue, Drs. Joseph Borrows and W. G. Palmer have declined, and Drs. W. W. Godding and J. F. Hartigan have been elected in their place.

THE

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THE EDITOR of this JOURNAL would be glad to receive any items of general interest in regard to local events, or matters that it is desirable to call to the attention of the profession. Letters written for publication or containing items of information, should be accompanied by the writer's full name and address, although not necessarily to be published. All communications in regard to editorial work should be addressed to the Editor.

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WHAT ARE THE CONDITIONS FOR RETAINING PERMANENT MEMBERSHIP IN THE AMERICAN MEDICAL ASSOCIATION?—This question was suggested by a perusal of the following letter:

"*Dear Sir*:—I have been a permanent member of the American Medical Association more than a quarter of a century. I signed the *regulations* when I became permanent member." If I attend the May meeting in Washington, must I sign again to be allowed to have my tickets? I have paid all my dues up to date. I claim that I am a permanent member, and will be until expelled. I believe in the new Code of Ethics of the State of New York, and cannot *sign again*. Please answer, that I may know whether *permanent* member, means *permanent* for one year, or until you are proven guilty of some overt act and expelled from the same. Yours respectfully."

It is evident that the writer of the foregoing letter regards the payment of the annual membership dues, as the only condition necessary to be complied with, in order to retain indefinitely the position and privileges of permanent membership in the national Association. The same view is undoubtedly entertained by many others. Indeed, no other one thing has surprised us so much as the degree of ignorance which exists among members of the Association concerning many of the plainest and most important provisions of its Constitution and By-laws. For instance, the clause of the constitution or plan of organization relating to permanent members, reads as follows:

"The *Permanent Members* shall consist of all those who have served in the capacity of delegates, and of such other members as may receive the appointment by unanimous vote, and shall *continue* such so long as they remain in good standing in the body from which they were sent as delegates, and *comply* with the *requirements* of the *By-laws* of the *Association*. Permanent members shall at all times be entitled to attend the meetings, and participate in the affairs of the Association, *so long as they shall continue to conform to its regulations.*

The last clause of the fifth By-law says: "Any permanent member who shall fail to pay his annual dues for three successive years, unless absent from the country, shall be dropped from the roll of permanent members, after having been notified by the Secretary of the forfeiture of his membership."

The reader will see from these provisions of the Constitution and By-laws, that the continuance of permanent membership is made to depend upon the three following conditions: 1. Remaining in good standing in the body or society from which he was originally sent as delegate. 2. So long as he shall comply with the requirements of the By-laws of the Association. 3. So long as he shall pay the annual membership dues. Failing in any one of these three conditions, he forfeits his permanent membership, while the right to attend the annual meeting in Washington or elsewhere, is made to depend directly upon the willingness of the member to *continue to conform* to the *regulations* of the Association. If, in accordance with the last paragraph of Section second of the plan of organization, the Association, through its registration officers, require every member to sign a card or certificate in which is a clause making the signer acknowledge obedience to the Constitution, by-laws and Code of Ethics of the Association before he can be registered and receive his card of admission to the meetings, and any permanent member or delegate refuses to sign such card, he by such refusal to "*conform to the regulation,*" simply forfeits his rights as a member; not by trial and expulsion, but by a deliberate and voluntary violation of the condition on which the enjoyment of the rights is made to depend. The duration of permanent membership, therefore, must depend entirely upon the choice of each member for himself. He can make it continue as long as he lives, by simply *complying* with the *conditions* specified in the Constitution and By-laws, as indicated above; or he can terminate it in one year, or one day, by refusing such compliance with either one or all of said conditions.

DR. FORMAD'S ARTICLE.—When, many weeks since, we received and published in the JOURNAL the first part of Dr. Formad's paper on the Bacillus of Tu-

bercle, we expected to receive the remaining part simultaneously with its appearance elsewhere.

For some reason, however, the copy did not come to hand until a few days since. Yet such is the intrinsic importance of the subject, and the high value of the paper, that we have felt justified in completing its publication in the present number.

CLOSE OF THE PROGRAMME OF WORK FOR THE MEETING OF THE ASSOCIATION.—The Chairman of the Committee of Arrangements at Washington, informs us that the *Official Programme* giving the titles to papers, etc., and their assignment to Sections, was to be positively closed on the 24th inst.; it having been kept open nearly a month longer than the By-laws require.

SOCIETY PROCEEDINGS.

CHICAGO SOCIETY OF OPHTHALMOLOGY AND OTOLOGY.

The society met Feb. 13, 1884. After transacting the usual routine business the following paper was read by Dr. E. L. Holmes on the Prognosis of Choroidal Sarcoma and Life Insurance:

"On Dec. 3, 1874, I extirpated the right eye of Mr. ——, 47 years of age, who came to me with the following symptoms: the pupil was closed, the cornea slightly vascular, the vessels of the conjunctiva much congested and tortuous; the tension of the globe was greatly increased.

The eye had been blind twelve years, had suffered from periodic pain two years, and from constant and severe pain eight months.

I expressed the opinion that the affection was glaucoma, following iritis or choroidal tumor. The case reported in Knapp's Archives, Vol. 6, proved to be a glio-sarcoma of the choroid, with small round cells.

Within a few days I have been requested by a life insurance company to express an opinion regarding the nature of this tumor, as the patient had applied for a policy.

The prognosis in cases of choroidal sarcoma has been of great interest to me, since my individual experience has been at variance with the opinions generally expressed on the subject.

I have been taught to believe that the average duration of life after the removal of the globe is only four years. In this case more than nine years have elapsed, with no symptoms of local nor of remote recurrence.

I occasionally meet a gentleman in most excellent health, one of whose eyes I extirpated with melanotic sarcoma fourteen years ago. I have enucleated the globe twenty-six times for this form of tumor, and have always urged the patient to inform me of any evidence of future local manifestations or of any impairment of the general health.

In only one case have I ever received a favorable or unfavorable report. In this case there was a speedy return of melanotic growths in the orbit, in the liver and different portions of the integument.

On the other hand, I have received subsequent reports in nearly all cases of glioma, for which I have removed the globe twenty-four times, and in which the glioma re-appeared in the orbit within a few months.

My own experience would not lead me to regard sarcoma of the choroid as a very malignant disease. Under all the circumstances, I am surprised that I have been able to obtain the subsequent history of so few of my patients, the more so in view of my experience with glioma.

The difference of opinion expressed by authors as to the ratio of fatality arises, I suspect, from the difficulty in following the subsequent history.

In reference to life insurance I can only say, I believe the application of a patient who has been affected by sarcoma could not be favorably entertained by the medical examiner."

Dr. Boerne Bettman mentioned two cases of eneucleation of one eye for sarcoma and glioma. In neither of these individuals had a return of the disease been noticed.

Fully six years have elapsed since the sarcoma was removed, and three years since the extirpation of the retinal growth.

Dr. W. T. Montgomery related an instance of reappearance of the tumor and death of the patient a year after enucleation of the eye. The sarcoma was in an advanced stage, and had broken through the globe.

Dr. Bishop then addressed the society on Acute Inflammation of the Middle Ear, its Causes and Treatment.

The causes of this disease may be arranged under the three following heads: I, natural causes; II, traumatic causes; III, predisposing causes.

Under the first category cold winds and drafts occupy a prominent position. Sudden and extreme changes in the temperature and humidity of the air are prolific causes of this disease. Water is a source of great evil. Swimmers and sailors are frequently subject to inflammatory attacks of the ears. The water may enter the middle ear through the Eustachian tube from a douche, and set up a violent irritation.

II. The second class of causes includes fracture of the temporal bone, contusions of the cranium and sudden forcible condensation of air in the external auditory canal from any cause, such as explosions of fire-arms, falls upon the ear. The harmful practice indulged in by parents and teachers of boxing and cuffing the ears is to be condemned. Several cases were cited of destructive inflammation and loss of hearing caused by this barbarous treatment. Picking and cleansing the ears with pins, toothpicks, pencils, introducion of beans, pebbles, insects, frequently give rise to much trouble.

III. The predisposing causes are the most numerous. All those diseases, conditions and practices which debilitate. Whatever causes congestion of the middle ear predisposes to an inflammation, such as quinine, excessive use of alcoholic beverages, strong coffee, tea, and much tobacco smoking, scarlet fever, diphtheria, and naso-pharyngeal catarrh.

During the first stage of the disease, the treatment should be palliative, constant application of cold, local depletion. Three or four leeches placed in front of the tragus will afford speedy relief. The hypodermic injection of morphine is preferable to instillation of Magendie's solution in the ear. The solution cools rapidly, and the change of temperature is apt to increase the inflammation. Tobacco smoke blown into the external ear, through a pellet of cotton, is a very efficient remedy. General refrigerant remedies must be employed. Laxatives, sudorifics, diuretics, should be prescribed on general principles. Nutritious but non-stimulating diet should be enjoined. A simple method to evacuate the middle ear is the following one. It is the reverse of the Valsalvian method of inflation. The patient is instructed to incline the head forwards, compress both nostrils with the thumb and finger, and close the mouth. Then he is directed to draw in the breath, as it were, thus producing by the inspiration a partial vacuum in the nasal cavities and pharynx. Immediately the fluid secretions in the tympanum are forced into the throat and expectorated. If there is great swelling of the walls of the Eustachian tube, the method may not at first succeed, but is easily practiced when the tumefaction is reduced. Patients should be directed to swallow after trying this experiment; the air re-enters the middle ear, and equilibrium of pressure is restored. Catheterization is recommended when this method fails. When rupture of the M. T. is inevitable, paracentesis is resorted to. During the second stage cleanliness should be strictly observed. When pain has ceased, the dry method of treatment with pulverized boracic acid or iodoform is introduced.

The carbolic acid treatment has not been satisfactory in the doctor's hands. A five per cent. solution is neeessary to destroybacteria; he is fearful that a solution of this strength might cause suppuration. One part of bromine to 1,500 parts of water, and one part of corrosive sublimate to 20,500 of water will destroy the bacteria in ten minutes. When the trouble shows a tendency to become chronic, the following formula is prescribed:

℞. Iodoform.....ʒi.
Zinc. Sulph.....gr. ii.
Aq. Dist.....ʒi.
M.

Dr. Gradle opened the discussion by stating that micro-rganisms are one of the causes of suppuration of the middle ear. Experiments have proven that progressive suppuration is always due to micro-organisms. As long as the discharge is profuse, bacteria are always present, they diminish and no longer increase in the the discharge as the inflammation subsides. Such micrococci have been found in abscesses, and are of considerable significance. His experience in the treatment of this disease has been limited entirely to the antiseptic method. He no longer uses boracic acid, having found a more efficient substitute in the combination of one per cent. of corrosive sublimate and bismuth. It checks suppuration more rapidly, and destroys the factor after the first application. A five per cent. solution of carbolic acid will not, according to the doctor's opinion, produce suppuration.

Dr. Starkey has seen good results follow the use of peroxide of hydrogen.

Dr. Holmes disapproved of paracentesis of the M. T. in acute suppuration of the middle ear. He thought the trouble would only be aggravated by such interference.

Dr. Montgomery stated that Politzer has abandoned operative treatment in acute suppuration, but practices the method in catarrhal inflammations where there is a serous secretion.

Dr. Hotz expressed doubt as to the possibility of performing the negative Valsalvian method in this disease, during the stage of inflammation, owing to the swollen condition of the mucous membrane lining the Eustachian tube. He could not satisfy himself that leeches put on the mastoid process were not as efficacious as when placed on the tragus. They relieve pain, and should be prescribed in every case. He is fully satisfied with the action of boracic acid, and does not approve of bismuth. This powder does not dissolve, and by accumulating in the ear might act as an irritant.

An interesting case of foreign body imbedded in the fundus oculi was then shown by Dr. Hotz.

The patient was injured six months ago, a piece of a steel punch penetrated the eye after passing through the upper lid.

Some time afterward he noticed a dimness of vision, followed by almost complete loss of sight. Externally no scar or sign of inflammation is visible; the pupil is somewhat dilated. The vitreous in the upper anterior part shows some cobweb-like opacities. In the upper and inner part of the fundus, close to the papilla, is seen a black, slender and round body, apparently about ¼ inch long, one end is fastened in the tissues of the eye, the other end of the splinter projects into the vitreous, reaching close up to the lens. The piece of steel is firmly fixed, it does not change its position during movements of the eye. The papilla, in fact, entire fundus, is blurred, owing to the neuro-retinitis.

BOERNE BETTMAN, M.D., Secretary.

RESORCIN.—Le Blond and Fissiâux recommend resorcin for chancroids in woman. It acts more quickly than iodoform, and has not such a disagreeable odor; it may be used either in powder or in 25 per cent. solution. Poisonous effects have never been observed.

April 10. The opacities in the vitreous have entirely disappeared, the fundus is much clearer, and vision has decidedly improved.

STATE MEDICINE.

MICHIGAN STATE BOARD OF HEALTH.

(Reported for the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.)

The annual meeting of the State Board of Health was held at its office in Lansing, April 8, 1884.

The members present were President Avery, Drs. Lyster, Hazlewood, Vaughan, Tyler, and Secretary Baker.

Reports of the sanitary condition of the Wayne county poorhouse and asylum, and of the Barry county jail were made by the committees who examined these institutions; and these reports were ordered printed.

Dr. Vaughan read a paper prepared by Dr. C. P. Pengra, which gave results of investigations relative to the purification of water by freezing. As a result of a series of elaborate experiments conducted in the University laboratory, Dr. Pengra found that, contrary to the general impression, freezing does not render water pure. Ordinarily he found less infusoria and bacteria in ice than in the water from which it was frozen, but the ice contained them in numbers sufficient to preclude its use. In harvesting ice, the greatest care should be taken to get it from a pure source. This valuable paper will be published in the report of the board.

The Secretary presented a summary compiled from lists of medical practitioners, registered under the new law. The number of counties in the State is 80, from 76 of which reports have been received. The number of registrations returned is 3,285, but in some cases physicians are registered in two or more counties. The number reported to have graduated is 2,351; those who had attended some college but had not graduated, 208; those who had attended no college, 726. The number, belonging to all schools, reported as having graduated, is 72 per cent. of the whole number; The non-graduated collegiates are 6 per cent., and the non-collegiates are 22 per cent. of the whole number. The "graduates" are from all classes of medical colleges, hospitals, medical societies, etc. The number of different "schools" of medicine reported in these sworn statements is about 75, including "Cureopathic," "Indian," etc. In at least one instance it is reported that the sworn statement had to be signed by a "mark," the practitioner being unable to write even his own name. The number registered as belonging to the four most prominent schools of medicine are as follows: Regular, 1,533; Homœopathic, 490; Allopathic, 398; Eclectic, 366. The proportion of graduates to practitioners is: Regular, 87 per cent.; Homœopathic, 74 per cent.; Allopathic, 81 per cent.; Eclectic, 47 per cent. (Of all schools, as above stated, the per cent is 72.)

It was decided to print the names and addresses of the health officers in Michigan as soon as full returns are received. The number in the State is nearly 1,400. A new edition of the document on the prevention and restriction of scarlet fever was ordered, the last edition of 30,000 copies being nearly exhausted. It was also decided to publish facts relative to several outbreaks of trichiniasis in Michigan.

The following resolutions were unanimously adopted:

Resolved, That this Michigan State Board of Health respectfully and earnestly memorializes Congress to pass the bill, introduced into the House of Representatives Jan. 8, 1884, by the Hon. Casey Young, or of some similar bill, providing for the prevention of the introduction of infectious diseases into the United States, and for procuring information relating to climatic and other conditions affecting the public health.

Resolved, That we consider the National Board of Health the best existing and the proper agency to carry on the work mentioned in the preceding resolution.

The Board discussed the merits of several textbooks on physiology and hygiene, with special reference to the effects of alcohol on the human system, and approved for use in the schools. Martin's "Human Body," briefer course, second edition, containing special chapter on alcohol and other narcotics; and Dr. Eli F. Brown's "Alcohol; Its Effects on Body and Mind."

The amount of office work during the quarter has been large, and has included the perfecting of arrangements for holding a Sanitary Convention at Hillsdale; preparation of the proceedings of the Ionia Sanitary Convention for the printer; the making of a compilation of the public-health laws of Michigan; proof-reading on 96 pages of the Annual Report; issuing blanks for the return of the new health officers in each city, village, and township in Michigan; issuing the regular weekly bulletins of meteorology, and of sickness in Michigan; the correspondence of the office (postals are not usually copied), covering 750 pages of letter-copying book, of which over 150 pages have direct reference to the prevention and restriction of communicable diseases in Michigan; and the regular computations of data relating to meteorology and sickness.

FIRST CONVENTION OF THE INDIANA STATE SANITARY SOCIETY.—*Reception Committee:* Hon. Jason B. Brown, Chairman; Mayor D. W. Johnson, J. D. Shields, M.D.; Hon. A. P. Charles; C. C. Frey, Esq.; J. H. Andrews, Esq.; Peter L. Carter, Esq.; C. B. Cole, Esq.; J. H. Charlton, M.D.; Hon. W. D. Marshall; J. W. Stratton, Esq.; L. M. Boland, Esq.; E. E. Rettig, Esq.; W. T. Brenaman.

Committee of Arrangements: Peter Platter, Esq., Chairman; Hon. D. W. Johnson; Capt. Joseph Balsley.

Committee on Programme: L. S. Oppenheimer, M.D., Chairman; S. H. Charlton, M.D.; T. S. Galbraith, M.D.

Committee on State Medicine: Thad. M. Stevens, Chairman, Indianapolis; William Lomax, M.D., Marion, Grant County; J. D. Gatch, M.D., Lawrenceburg; George Sutton, M.D., Aurora; J. M. Wooden, M.D., Greensburg.

The first session of the Indiana State Sanitary Convention was opened at Seymour, Indiana, March 12 and 13, 1884, with Dr. Norbourne N. Shipman in the chair. Letters of regret were read from prominent sanitarians. Dr. Thad. M. Stevens, of Indianapolis, read a paper on the purposes of a State sanitary society. Legislation concerning the destruction of filth was treated by Rev. George L. Curtis, of Jeffersonville. His conclusion, drawn in part from the experiences during the recent flood, were suggestive of the effects of filth as a cause of disease. In the afternoon Hon. F. J. Van Voorhees, of Indianapolis, presented a paper on food and raiment, showing the necessity of proper food, well prepared, and sufficient clothing, made on common sense principles. The proper ventilation of homes and public buildings was the subject of a paper by Dr. W. S. Haymond, of Indianapolis. A paper on chest pressure, by Prof. Thomas Harrison, of Brownstown, was read, illustrating the inevitable injuries following tight lacing. In the evening Dr. Shipman read an address on the proper way to teach sanitation. Mrs. Virginia L. Oppenheimer read a paper on sanitary cooking. On Thursday, the second day, Dr. M. L. Boas, Secretary of the County Board of Health, presented a sanitary survey of Jackson county, in which he was particularly severe on farming out medical attendance at the asylum. Dr. J. M. Moulder, of Kokomo, read a paper on the influence of tobacco and alcohol on the human race. Dr. E. S. Elder, Secretary of the State Board of Health of Indiana, read a strong paper on the objects and uses of the State and local boards of health, The importance of compulsory vaccination was argued by Dr. T. A. Graham, of Jeffersonville. Dr. J. W. Hervey, of Indianapolis, one of the veterans in sanitary work in Indiana, read a paper on the influence of habits and uses on the public health. A committee read resolutions on the death of Dr. L. P. Yandell, of Louisville, which were adopted. Dr. S. H. Chalton, after presenting a synopsis of his sanitary survey of Jackson county, was requested to complete it for the committee on publication. There was a large attendance at the closing session of the convention in the evening. A paper on nearsightedness in children was read by Dr. W. Cheatham, of Louisville, which was illustrated by several magic lantern views. A pleasant feature of the meetings was the free discussion of the papers presented. After votes of thanks, the convention adjourned.

It is the purpose of the State Sanitary Society to call other conventions at an early date.

DOMESTIC CORRESPONDENCE.

FROM WASHINGTON.

Medical Matters Before Congress.—April 7, Representative Murphy introduced a bill (H.R. 6524), declaring that all persons who, during the late war of the Rebellion, served in the Union Army as contract surgeons, shall be entitled to all the rights, benefits, and privileges conferred on surgeons and assistant surgeons of the army under the various provisions of the homestead laws. It was referred to the committee on military officers.

Medical Societies, etc.—A new Medical Society has recently been started here, which has been incorporated as the Medico-Chirurgical Society of the District of Columbia. Dr. Robert Reyburn is the President, and, among others, it includes all the colored practitioners of medicine in good standing in the District. It seems to emanate mainly from the faculty and graduates of the medical department of Howard University.

NECROLOGY.

OBITUARY NOTICE.

B. H. Reynolds, M.D., died at his residence in Manchester, Delaware county, Iowa, Nov. 13, 1883. He was born in Greene county, New York, July 22, 1839, and consequently was little over forty-four years of age. When a boy of ten years, he came with his parents to Indiana. In 1861 he enlisted as a soldier in the 76th Regiment Illinois Volunteers, and served nearly three years. During the war he gave evidence of skill in nursing, and was twice placed in charge of a hospital, as hospital steward. One of these hospitals was at Vicksburg, Miss. While in charge of them he was highly complimented by the governmental inspectors upon the excellent sanitary condition of his wards, and his careful attention to hygienic details. At this time he decided upon his future course, and began his medical studies. In fact, he was even during this period called by most of his comrades "doctor." At the close of the war he attended a course of medical lectures at the University of Michigan. In 1866 he came to Masonville, Iowa, and began the practice of medicine, but did not complete his course of study until the winter of 1871–'72, when he graduated at the Iowa State University. In 1874 he removed to Manchester, Iowa, where he continued his practice until death. He married Miss Jennie Peterson, of La Porte, Ind., Feb. 9, 1864. She still survives him, but he left no children. For a number of years Dr. Reynolds was President of the Delaware County Medical Society. Its members attended his funeral in a body, as a mark of respect for their departed Fellow. He was also a member of the Iowa State Medical Society, and of the American Medical Association. He attended the last session of the latter at Cleveland, Ohio, in June, 1883. He was a member of the M. E. Church of Manchester, and his funeral occurred from thence, on Saturday, Nov. 17, 1883. It was very largely attended, people coming from all parts of the county to attend the funeral of their physician and friend. As a physician, Dr. Reynolds was deservedly popular. Possessed of a wonderfully genial and kindly disposition, his very presence brought comfort and good-cheer to his patients in their dis-

tresses. Cut down in his prime, and in the midst of a large and busy practice, it seems difficult to understand *why* he should be so taken, and to yield submission to his removal. Of apparently strong and vigorous constitution, firm and elastic step, and imposing presence, few gave promise of longer life than he. But the silver cord is loosed, the golden bowl is broken, and he has gone to his long home. A post-mortem examination revealed a very extensive meningitis, more severe at base of brain. In the anterior and middle fossæ, the membranes were everywhere firmly adherent to the skull. The bone itself was also softened and fragile. The petrous portion of left temporal bone was easily broken by slight manipulations. A large effusion of sanious pus was found within the membranes, estimated at about 2½ ounces in quantity. In the right temporal region was a considerable extravasation of blood. In view of these lesions, it seems almost incomprehensible that there was so little disturbance of reason and mental activity. He was almost constantly rational, until about twenty-four hours before death.

N. S. C.

ROBERTSON, CHARLES, M.D., died at his residence in McConnelsville, Morgan County, Ohio, March 24, 1884. He was born at Leesburgh, Va., July 13, 1799. His parents moved to St. Clairsville, Ohio, about 1810, where he learned printing, in the office of the Ohio *Federalist*, then edited by the late Charles Hammond, Esq. The doctor was appointed postmaster at St. Clairsville. He studied medicine with Dr. W. Wood. Dr. Robertson was the oldest living charter member of the Morgan County Medical Society. He was for several years a member of the Ohio State Medical Society, and a delegate to the American Medical Association in 1856. He was married to Eveline S. Foulke, by whom he had four children, only one of whom is living. Eveline died, and he married Dessa Brown, of Pittsburgh, Pa., by whom he had one child, who with her mother survive him. When the doctor was first married he moved to Woodsfield. He removed to McConnelsville in the spring of 1826, formed a partnership with Dr. S. A. Barker, which continued till Dr. Barker was appointed Registrar of the land office, and removed to Zanesville, Ohio. Dr. Robertson graduated at the Jefferson Medical College, Philadelphia, Pa., in 1849. He was Enrolling Surgeon of the Fifteenth District of Ohio in the late war. He was a very successful physician, and for nearly half a century was an eminently useful member of the Morgan County Medical Society. He was one of its most energetic and worthy members, a true friend to his associates and a noble man. H. J. NOYES, M.D., of Ohio.

AN INTERESTING TREE.—At a recent meeting of the Berlin Medical Society, Prof. Virchow showed photographs of a gigantic plane-tree in the island of Cos, under the shade of which Hippocrates is said, by tradition, to have held medical consultations. The tree now stands in the market-place of the town of Cos, on the east side of the island. The branches, which spread over nearly the whole market-place, are supported by marble pillars.

SPECIAL NOTICES.

INTERNATIONAL HEALTH EXHIBITION.

The Secretary of the Library Committee presents his compliments to the editor of the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, and requests the insertion of the following paragraph:

INTERNATIONAL HEALTH EXHIBITION.—A somewhat novel feature in connection with the exhibition this year will be the establishment of a library and reading-room, a home for which the Executive Council have assigned in the large double room in the Albert hall, overlooking the conservatory. Steps have been taken to secure a representative collection of works on vital statistics; of reports and regulations relating to public health; of regulations with reference to injurious trades and works thereon; and of reports, statistics, and other works on the science of education. Foreign powers have been invited to lend their coöperation in this effort to create an internationat library of works of reference bearing on the two divisions of the exhibition, and several responses have already been received. India and the Colonies have also been asked to contribute towards the same end. Publishers and authors have likewise been invited to forward copies of their works. In addition to the library of reference, there will be a reading room, to which the current numbers of periodical publications of a sanitary or educational character will be admitted. All books and periodicals sent to the library and reading room will, under certain regulations, be arranged for the use of visitors, and not merely for exhibition. The books will be submitted to the jurors, and a full catalogue will be issued. All parcels for the library and reading room should be addressed, carriage paid, to the Secretary of the Library Sub-Committee, Royal Albert Hall, London, S. W.

April 2, 1884.

FLORIDA MEDICAL ASSOCIATION.

The Florida State Medical Association will hold its annual meeting in the city of Jacksonville, on Wednesday, June 4, 1884, at 12 M.

County Medical Societies are invited to send delegates, and all physicians who are graduates from regular schools of medicine, are cordially invited to be present.

Essays are promised by the following physicians:

Dr. R. B. S. Hargis, "Malaria and the Relations of Micro-Organisms to Disease."

Dr. R. P. Daniel, "The Tongue in Disease, and its Diagnostic Value."

Dr. C. J. Kenworthy, "Phthisis Pulmonalis."

Essays expected from other prominent physicians. T. M. Palmer, M.D., Orator.

Efforts will be made by the Committee of Arrange-

ments to obtain half rate tickets on railroad and steamboat lines for delegates to the Association.

E. T. SABAL, M.D., Pres.

Attest: A. W. KNIGHT, M.D., Sec.

Office of Secretary, Jacksonville, Fla., April 3, 1884.

ROCKY MOUNTAIN MEDICAL ASSOCIATION.

The thirteenth annual meeting of this association will be held in the City of Washington, on Wednesday evening, May 7, at 8 o'clock P. M. The place of meeting will be announced by the Secretary of the American Medical Association from the platform, on May 6.

The annual address will be delivered by the President, Dr. J. F. Hibberd, of Richmond, Ind.

As the number of members of this association is yearly decreasing, it is hoped that there will be a full attendance. JOHN MORRIS, Sec.

5 Franklin St., Baltimore, Md.

RAILROAD NOTICE.

Dear Dr. Davis:—I am authorized to make the following statement. It came too late for insertion in the *Courier-Record*, where it was intended to be published, but I thought if it were printed in your journal, it would still reach a large number of persons interested, in this State.

The Piedmont Air-Line have tendered the Medical Association of Texas one round-trip rate, of $49.50, to Washington, to the convention of the American Medical Association, in May. This rate will be participated in by the Gulf, Colorado and Santa Fe Road, and the G. H. & S. A., and the N. O., Tex. Railways. This rate, good for thirty days, and parties wishing to do so, can stop off at points on the return to Texas. The trains leave Houston at 6 P. M., and arrive at Washington on the third morning at 10 o'clock. Through sleeper from New Orleans to Washington, without change.

For information, and for sleeping-car berth, apply to JAMES M. MEANS,

Gen. Tex. Pass. Agt., Houston, Tex.

April 14, 1884.

BALTIMORE & OHIO R. R.

The Baltimore and Ohio R. R. will run a special train of palace coaches, exclusively for physicians and members of their family, leaving Chicago on Sunday, at 3 P. M., May 3, arriving at Washington about 4 P. M. of next day. Fare to Washington is $17.50 from Chicago. Return fare at one-fourth the unlimited rate. Tickets good for 30 days. By charter of sleeping cars on this train at $100 each, 26 berths to a car would make the rate $3.85 per berth.

The fare via the P. F. W. and Pennsylvania Roads, also a direct line from Chicago to Washington, is the same on their regular trains, namely, $17.50, and all other lines have made rates in the same proportion, as was announced in last week's JOURNAL, which will doubtless secure a larger attendance than at any of the previous meetings.

NEW BOOKS.

Martin, H. Newell, and Nerale, W. A. Handbook of Vertebrate Dissection. Pt. 3 How to dissect a rodent. New York: Macmillan. 60c.

Annuaire médical et pharmaceutique de la France, pour 1884. Paris: 18mo., 536 pp. 4 fr.

Bardet, G. Traité élémentaire et pratique d'électricité medicale. Paris: Doin. 8vo. x, 645 pp., avec 234 fig. 10 fr.

Bourgougnon, H. Recherches sur l'état du cœur à la fin de la grossesse et dans les suites de couches. Paris: Davy. 8vo., 71 pp.

Bruel, G. De l'éther amyl-valérianique (principe actif des pommes) de son action sur la cholestérine, de sa supériorité sur le chloroforme comme dissolvant des calculs hépatiques, et de ses actions thérapeutiques. Paris: Paul Dupont. 8vo, 11 pp.

LIST OF CHANGES IN THE STATIONS OF MEDICAL OFFICERS, U. S. NAVY, FOR THE WEEK ENDING APRIL 19, 1884.

Medical Inspector H. C. Nelson, detached from Navy Yard, Washington, and placed on waiting orders.

Surgeon D. McMurtrie, ordered to duty at Navy Yard, Washington.

Medical Director P. S. Wales, to continue on duty as member of Ration Board.

Surgeon H. M. Wells, to special duty at Hot Springs, Ark.

Medical Director Geo. Peck, ordered as President of Board of Medical Officers, detailed for special duty at Coaster's Island, near Newport, R. I.

Medical Director A C. Gorgas and Surgeon I. C. Wise, members of above Board.

OFFICIAL LIST OF CHANGES IN THE STATIONS AND DUTIES OF OFFICERS SERVING IN THE MEDICAL DEPARTMENT UNITED STATES ARMY, FROM APRIL 12, 1884, TO APRIL 18, 1884.

Baily, Joseph C, Major and Surgeon, leave of absence extended for three months. (By par. 8, S. O. 83, A. G. O., April 10, 1 4.)

Newton, R C., 1st Lieutenant and Assistant Surgeon, relieved from duty at Fort Sill, Ind. Ter., and ordered to Fort Elliott, Tex., for duty. (Par. 1, S. O. 77, Headquarters' Department of the Missouri, April 14, 1 4.)

Vilcher, James E., 1st Lieutenant and Assistant-Surgeon, assigned to duty at Camp Poplar River, Mont. (Par. 2, S. O. 37, Headquarters Dept. of Dak., April 7, 1 4.

Chapin, Alonzo R., 1st Lieutanant and Assistant-Surgeon relieved from Duty at Fort Douglas, Utah, and ordered to Fort Laramie, Wyo., for duty. (Par. 2, S. O. 33, Headquarters, Dept of the Platte, April 15, 1 4)

Wales, Philip G., 1st Liutenant and Assistant-Surgeon, ordered to report to the commanding general, Dept. of the Columbia, for assignment to duty. (Par. 11, S. O. 84, N. G. O., April 11, 1 4)

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AND OF ITS SEVERAL SECTIONS 1883-4.

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Place of meeting, 1884, Washington, D. C.; Time of holding meeting, first Tuesday in May.

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